

## **Selected Vendor Telecommunications Products**

This appendix provides descriptions of selected vendor products based on telephone interviews conducted during August-October 1995. Reports, technical material, and press releases were used to supplement the interviews. Vendor products are described separately in order to avoid redundancy in the summaries of utility projects that use the same product.

Product: CellNet

Developers: CellNet Data Systems

Investors: AT&T Ventures  
Bank of Boston  
Toronto Dominion Investments  
Barclay's Bank  
Providence Ventures  
Hambrecht & Quist  
Kleiner, Perkins, Caufield & Byers

Background: CellNet was founded in 1984. Much of its beta testing was performed in Pacific Gas & Electric's service territory. CellNet offers an improvement over mobile wireless radio networks which use "virtual" two-way communications to wake up transmitters that send meter readings to hand-held or other mobile receivers. CellNet's fixed wireless radio system consists of a two-way network from the local poletop collector back to the utility's central location. Most of CellNet's utility clients use the distribution automation applications exclusively.

Description: The CellNet product permits wireless, fixed-network data gathering for automated meter reading and distribution automation, as well as other commercial applications. CellNet offers utilities a complete turnkey approach to wireless communications services. The utility signs a long-term performance contract with CellNet for installation, operation, and maintenance of the system, paying a fee of roughly \$1.00 per meter per month for the basic service of a daily meter read. Cellnet has signed two long-term services contracts with utilities (Kansas City Power and Union Electric), which will ultimately enable the utilities to provide over one million urban customers with service options such as power outage reporting and time-of-use rates. Many of CellNet's applications are in capacitor bank control and distribution automation, where efficiency gains from automation will accrue immediately to the utility.

Features: ● The wireless data network employs two integrated radio technologies, direct-sequence spread spectrum (licence-free) and narrowband (licenced), which make the system less resistant to interference and more efficient.

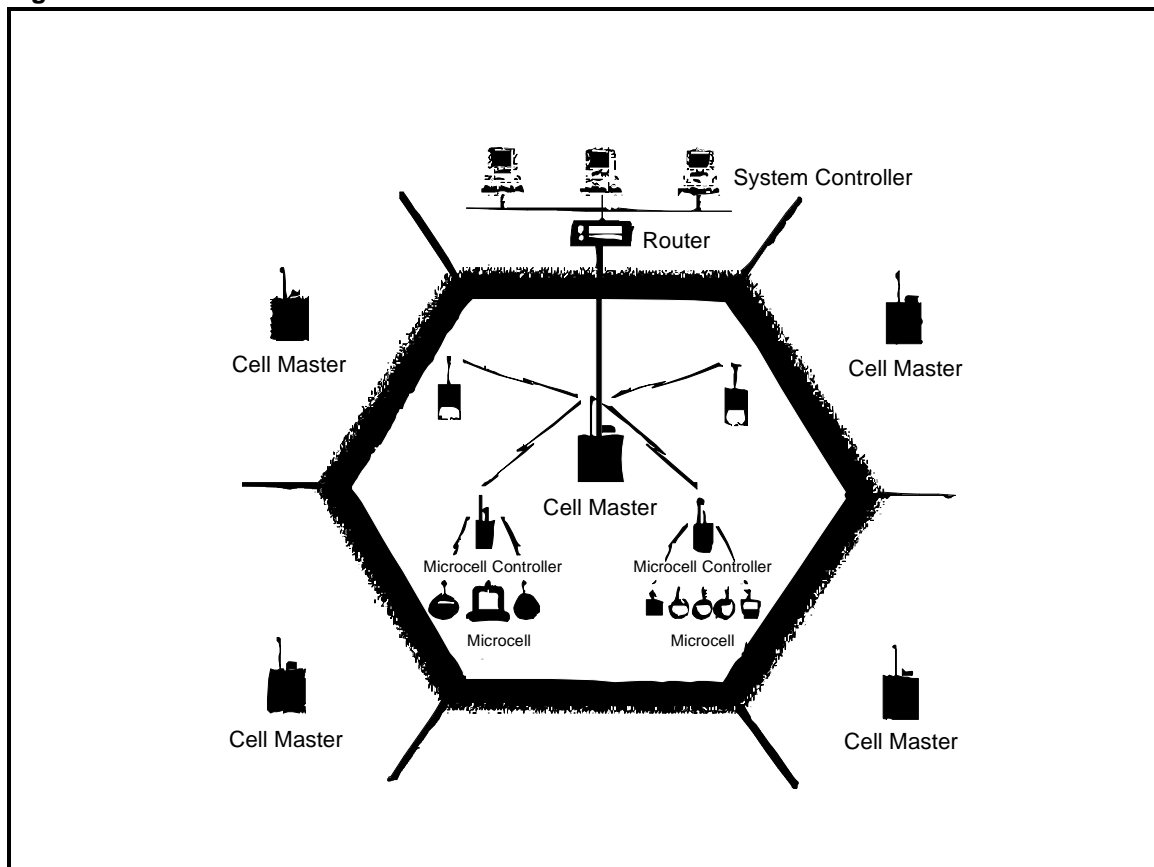
- The Microcell Controller, a small pole-mounted data collection device, communicates with up to 700 meters within a 1/4-mile radius (see Figure A-11). The actual number of meters varies depending on population density and topography. Data from the Microcell Controllers is then

passed along to a Cellmaster with a communications radius of 7-9 miles, and then via leased-line to the utility.

- Utilities can use the data provided by CellNet to offer customers innovative rate programs and other enhanced services.

- Projects:
- Pacific Gas & Electric's pilot with 350 residential customers in the North Bay extended from 1990 to 1993.
  - Kansas City Power & Light signed a long-term contract in September 1994. The first 5,000 meters were deployed by October 1994. To date, more than 80,000 meters are installed, and the remaining meters to complete the roll-out of 420,000 meters will be installed by the end of 1996.
  - Union Electric Company in St. Louis signed a contract in September 1995. The first 5,000 meters were installed within 14 days of contract signing, and full-scale roll-out of 650,000 meters will commence in March 1996.

**Figure A-1. CellNet's Network Architecture**



Product: Cox

Developers: Cox Communications  
Northern Telecom (Nortel)  
Virginia Electric Power (VEPCO)

Investors:

Background: Nortel and Cox are collaborating to test an integrated box offering four services -- telephone, high-speed data, energy management, and switched cable. Switched cable is essentially video on demand with special channels personalized for each customer. If all customers wanted to view movies simultaneously, Cox would not have enough channels; switching permits many more viewers. The integrated box will contain cards for each of the four services that can be plugged in to provide the desired level of service. Nortel, Cox, and VEPCO are each responsible for testing and covering the costs of their own services.

Description: The pilot involves the installation of an integrated box in the homes of eight VEPCO and 36-40 Cox employees. Nortel and Cox are testing the homes for ingress noise and signals that could interfere with the communications platform. VEPCO is the project integrator and is currently selecting equipment vendors. The installations were scheduled to begin in September and be completed by December. Initially, the pilot will offer one of the four services to customers and will add services as the program continues. Automated meter reading, outage detection, and electronic billing will be tested first, followed by CEBus-adapted devices, which will be tested in 10 homes.

Features: ● The in-home display may use the television, personal computer, thermostat, or hand-held devices. VEPCO expects customers with computers to use them to handle energy management.  
● The bench tests and technical trials will identify protocol limitations with CEBus-based equipment

Projects: ● VEPCO's multi-phased trial in Virginia Beach and Norfolk began in May 1995.  
● Southern California Edison's trial of Cox cable products in Irvine began in mid-1995.

Product: Energy Information Services

Developers: Pacific Gas & Electric (PG&E)  
TeleCommunications Inc. (TCI)  
Microsoft  
Diablo Research  
Energy Line

Investors: TeleCommunications Inc. (TCI)  
Microsoft  
Landis & Gyr

Background: This project has three executive team members: PG&E, TCI, and Microsoft. TCI provides the set-top box, coax cable, and hook-ups. Microsoft developed the operating system software compatible with the CEBus chip in the set-top box; Intellon provided the CEBus chip. PG&E is the project integrator, providing the plug controllers and power-line carrier interface and contracting for all equipment and services. A series of second-tier participants are also involved: Landis & Gyr provides the customer meter and HVAC controller, which will eventually be handled via the set-top box; Ademco, the largest manufacturer of security systems, has signed on to provide home security in the third phase of the project; and Andersen Consulting administers an affiliate program and provides systems engineering and market research.

Description: The project began in 1994 and will continue until July 1996. Currently, 10 homes in Walnut Grove and Sunnyvale are participating in the "market research" trial. TCI plans to begin hooking up two participants per day to reach 100 participants in this phase and to expand to 1000 homes in 1996. TCI purposefully selected non-cable subscribers for the trial in order to determine the full costs to all team members. The team is assessing alternative energy and non-energy services to offer and prices that customers would be willing to pay for these services. PG&E is evaluating home automation, home security, customized billing, access to the information superhighway, and telemetry. TCI is evaluating video-on-demand and a dedicated energy channel, but this service will not be offered in this trial.

Features: ● Participants can monitor energy use by appliance/equipment, program appliance/equipment to respond to four price signals, and receive automatic meter reading and outage detection.

- Proprietary market research has been performed since the beginning of product development. Focus groups were conducted but most customers had difficulty conceiving what they were being offered.

- Projects:
- Pacific Gas & Electric's three-phase pilot began in October 1994.
  - Andersen Consulting administers an affiliate program. Andersen recently sent out invitations to all utilities in the U.S. and Europe to participate in the PG&E trial by joining an executive board overseeing the project, paying a \$75,000 fee, sharing in all market research (which PG&E plans to keep private), and ultimately agreeing to deploy a similar program in their service area.

Product: ERT (Encoder, Receiver, Transmitter)

Developers: Itron

Investors:

Background: Itron was formed in 1977 to develop a technology to assist utility customers with onsite meter reading. Itron began public trading of its stock in late 1993, when it had sales of approximately \$100 million. Itron has deployed ERTs in the meters of over 70 utilities. Their technology has gone through several generations: meter readers using hand-held calculators that took readings from meters equipped with an ERT to mobile vans that were driven by meter readers (no faster than 25 mph) which allowed up to 25,000 meters a day to be read.

Description: Itron's utility clients typically use the mobile meter reading product, having implemented a mobile automated meter reading system for all customers in sufficiently densely populated neighborhoods to make the one-way communications service cost effective. Itron manufactures and sells the meter switches, radios, and receivers to utilities, who install the equipment with their own staff or contractors. The next generation Itron system is a fixed network, with two-way communications to accommodate energy services offered by telephone and cable systems, such as time-of-use pricing, outage detection, and energy information (see Figure A-2). The controller, located on top of a pole in a neighborhood, rather than in a van, will send a signal to wake up the meter and the meter will send in its reading. The pole-top collector is equipped with a CPU, wireless radio, and the equivalent of the hand-held device used by meter readers.

Features: 

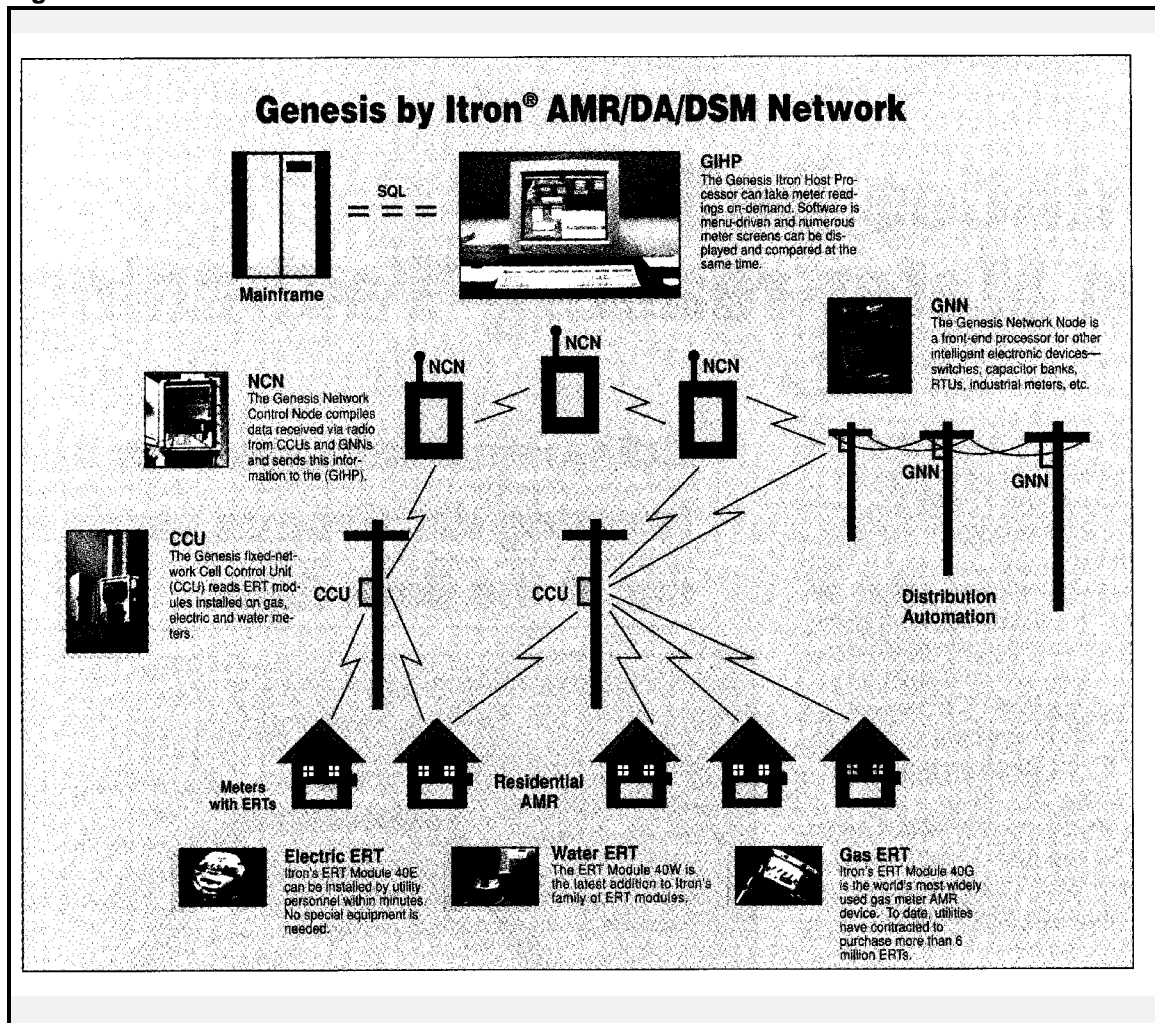
- Utilities benefit because of the productivity gains from automatic meter reading, particularly in densely populated services areas or areas with a large number of meters in difficult or dangerous-to-read locations.
- Utilities also receive fewer customer inquiries regarding estimated bills or high or low bills that occur because the meter was located inside or the meter reader made an error.

Projects: 

- Baltimore Gas & Electric is retrofitting 500,000 meters for mobile Itron meter reading by the end of 1997.
- Boston Edison will have 60,000 meters retrofitted for mobile Itron by the end of 1995.
- Public Service Company of Colorado has retrofit 300,000 electric and gas meters for mobile Itron radios; pilot fixed network Itron for 1,500 inaccessible meters began in June 1995.

- Georgia Power reads 52,000 dangerous and hard-to-read meters with mobile Itron radios.
- Pacific Gas & Electric reads 75 inaccessible meters with mobile Itron radios.

Figure A-2. Genesis AMR/DA/DSM Network







Product: Integrated Broadband Utility Solution (IBUS)

Developers: Lucent Technologies  
Public Service Electric & Gas (PSE&G)  
Intellon  
Honeywell  
General Electric  
American Meter  
Andersen Consulting

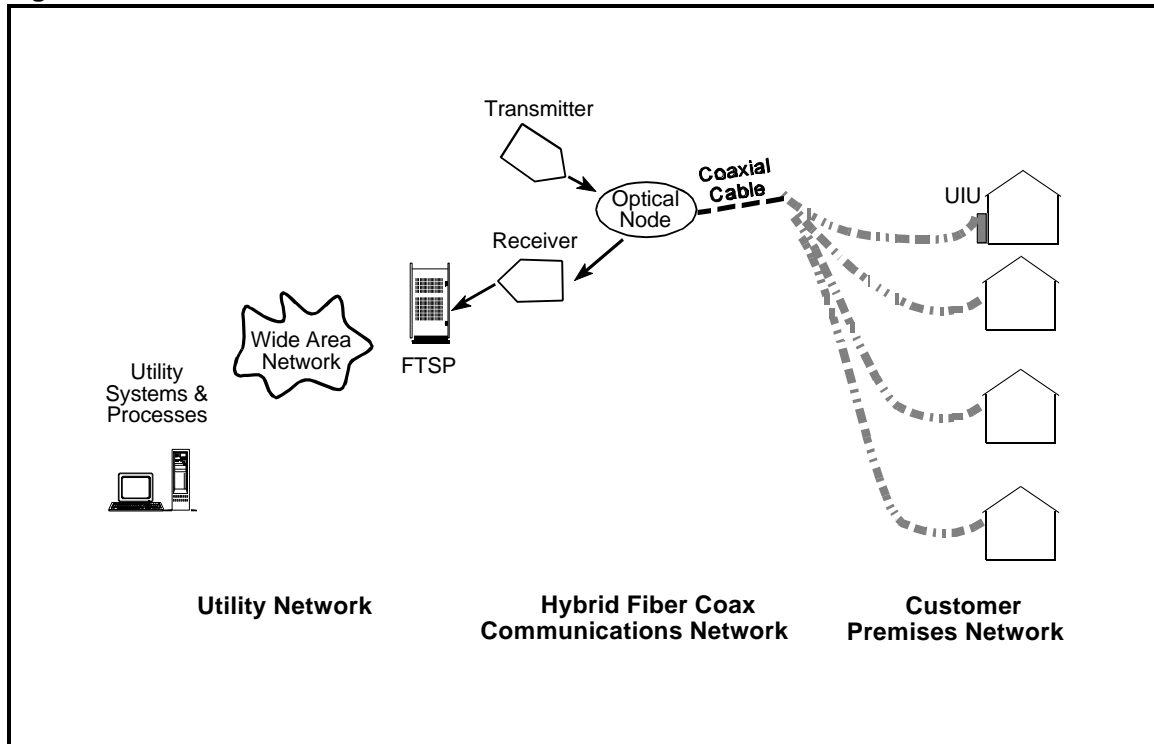
Investors: Lucent Technologies  
PSE&G

Background: Lucent Technologies (formerly part of AT&T) and PSE&G are codeveloping IBUS to offer a two-way, interactive customer communication system that is tailored to the operational needs of electric and gas utilities and allows the utility to develop new value-added services (e.g., security, medical alert, and alarm services). Lucent is packaging IBUS as a fully integrated turnkey system which can provide various products and services to meet the diverse needs of different types of customers (e.g., residential, commercial/industrial). Lucent has been responsible for system specifications, software & hardware design, system integration of supporting products, and prototype testing, while PSE&G has been responsible for conducting field trials and system-wide deployment and describing the functional requirements of the utility.

Description: In April 1995, Lucent & PSE&G completed a proof-of-concept trial in 10 "friendly" homes (employees of Lucent, PSE&G, or Garden State Cable) and installations have been completed in the 1000-home customer pilot. Features to be deployed and tested in 1996 in some or all of the 1000 homes participating in the technical trial include automated meter reading for electric and gas, detailed customer load profiles at 30 minute intervals, remote connection and disconnections, sending real-time prices to customers, power outage reporting, theft-of-service detection, utility-controlled load management, emergency gas curtailment, customer information messaging, and automatic control of thermostats by customers that have been programmed to respond to price fluctuations.

Features: ● Figure A-3 provides an overview of the IBUS network architecture in the PSE&G project: hybrid fiber coax cable network from the utility headquarters over a Wide Area Network (WAN) through a Fault Tolerant Signal Processor (FTSP) to a Local Area Network optical node. This node connects to an utility interface unit (UIU) via coax cable at 64 kb/second.

Figure A-3. IBUS Network Architecture



The UIU is typically connected to 4-6 homes via power line carrier and wireless RF at 9.6 kb/second.

- Within the Customer Premises Network, various customer premise equipment will be installed depending on services required: CEBus-compatible, 3-phase electric meters (GE), gas meter modules (American Meter), “smart thermostats and home automation applications (Honeywell), and chips and components to facilitate CEBus-based, in-home communication (Intellon).
- The IBUS system is based on “open” standards (e.g., CEBus) and communication protocols, which are shown in Table A-1. Because the specifications will be “open,” Lucent envisions that other manufacturers can supply various parts of the system or add additional equipment.
- Because of the limited bandwidth (PLC or RF) between the UIU and homes, IBUS is optimized for electric utility applications and is not designed to provide cable, telephony, or video services over its network.

**Table A-1. Integrated Broadband Utilities Solution (IBUS)**

	Within Home	Home to UIU	UIU to Node	Node to FTSP	FTSP to Utility
Open	Yes	Yes	Yes	Yes	Yes
One or Two Way	Two Way	Two Way	Two Way	Two Way	Two Way
Standard	CEBus	CEBus	MMS/HDLC	MMS/HDLC	MMS/TCP/IP
Media	CEBus powerline carrier or radio-frequency	CEBus powerline carrier or radio-frequency	COAX, (alternate PCS or CDPD)	Fiber, (alternate PCS or CDPD)	WAN
Where	Premises	Collar Count, Pole Top	Neighborhood Node, Base Station	Head End, Central office Mobile Switching Center	Utility
Data Rate	9.6 kb/s	9.6 kb/s	64 kb/s	64 kb/s X # fibers	Varies
No. of Customers	1	1-20	500 - 1500	10,000 - 20,000	> 5 million

Note: FTSP = Fault-Tolerant Signaling Processor, UIU = Utility Intelligent Unit

Source: Lucent Technologies

- Projects:
- PSE&G's multi-phase development and deployment began in early 1995.
  - Consolidated Edison and Louisville Gas & Electric have also signed agreements with IBUS; Consolidated Edison's application will target commercial customers.

Product: IRIS Fixed Network

Developers: IRIS Systems

Investors:

Background: IRIS is a Canadian firm that entered the U.S. market for wireless radio network systems. IRIS was recently bought out by Itron.

Description: IRIS technology consists of wireless radios (two-way, 900 MHZ) licensed on both sides, to the home and the utility (unlike CellNet which is licensed only on one side). Each meter is retrofitted with a radio. One controller can handle 25 repeaters which each handle up to 1,000 meters. The signal is decoding by the IRIS Sun Workstation at utility headquarters.

Features: 

- The modular PBX software can be turned on as needed to gain functionality for Baltimore Gas & Electric customers.
- IRIS can be interfaced with thermostat and CEBus adapters programmed to control appliances.

Projects: 

- Baltimore Gas & Electric's pilot for 100 homes in Timonium, Maryland, began in late 1994.
- British Columbia Hydro's trial began in May 1994.
- Winnipeg Hydro's trial began in March 1994.

Product: Meter Minder

Developers: Interactive Technologies Inc. (ITI)

Investors: Wright-Hennepin Cooperative Electric Association  
ITI  
National Rural Electricity Cooperative Association (NRECA)

Background: Meter Minder was introduced four years ago. The product was co-developed by ITI and Wright-Hennepin with a research and development grant from NRECA for \$300,000. Wright-Hennepin was already in the security business before joining forces with ITI. As a result, the product has always been geared towards electric cooperatives.

Description: Meter Minder integrates automated meter reading with home security and safety services. It is a two-way communications device, using the telephone network outside the home and wireless within the home (see Figure A-4). The provision of services is not limited to a utility's territory. For example, Wright-Hennepin performs central monitoring for two cooperatives that cannot afford such service. Home security services generate the most income for this product. A standard package, including a CPU, two door sensors, a smoke or motion detector, and an interior siren, is offered by Wright Hennepin at no initial cost to its customers; customers may add on equipment as needed.

Features:

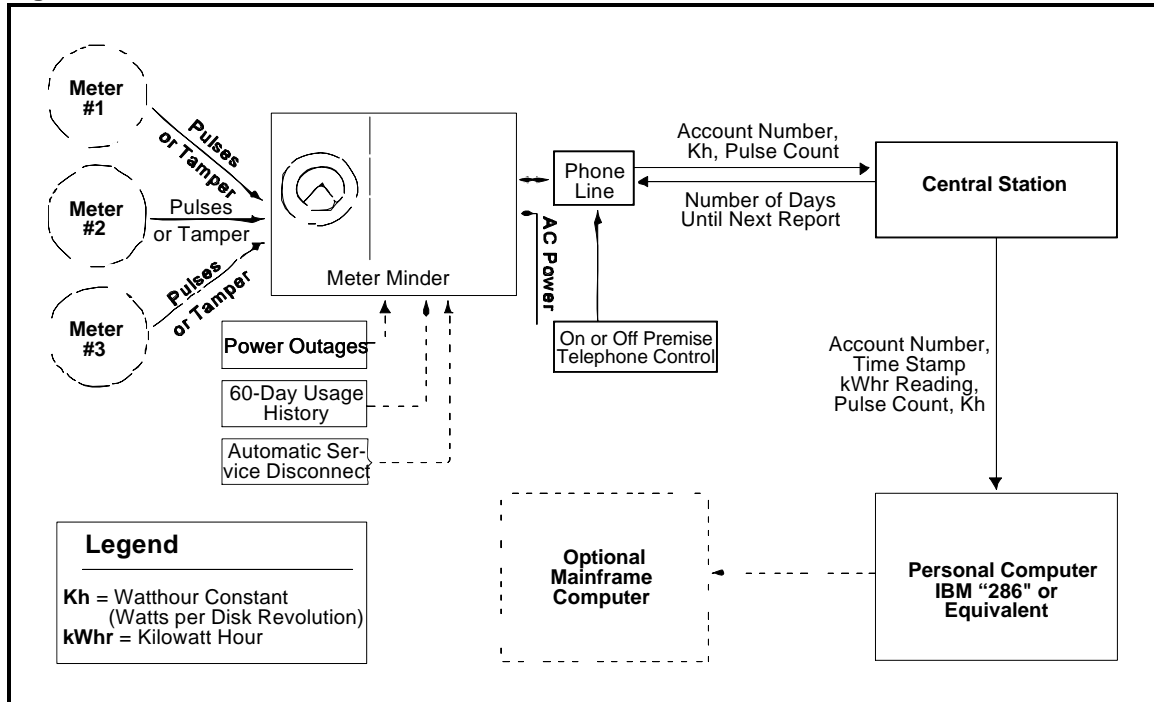
- Thermostat setback on time schedules (not price signals);
- Outage detection;
- Automated energy billing and rolling usage history of customer (60 days) for utility in case it needs to explain unusual usage/billing, upon customer request;
- Automated meter reading;
- Remote on/off (although not all utilities request this option);
- An energy saver module, which customers can add permitting them to access remotely an ITI setback thermostat via touch tone phone and allowing them to turn on lights and turn up the heat in weekend cabins (from car or home);
- Wireless home security with monitoring.

Projects:

- Wright-Hennepin's pilot began in 1991; the roll-out has involved 3,000 customers.
- About a dozen utilities, mainly rural cooperatives, have enough units installed to be considered a project. A number of these utilities are

aggressively marketing safety and security services to residential customers.

Figure A-4. Meter Minder



Product: PowerView

Developers: First Pacific Networks (FPN)

Investors: Central & South West (CSW)  
Entergy  
Sprint (also involved with TeleCommunications Inc.)

Background: FPN was founded in 1988 and went public in 1992. In 1989, Glasgow (Kentucky) Electric Plant Board was a beta test site for FPN 1000, the predecessor to PowerView. FPN 1000 offers telephone service over a cable TV (CATV) network. FPN provided the software for free and Glasgow's line crews strung all of the cable (160 miles of coax). The system currently accommodates 44 CATV channels and a two to three megabit data WAN. FPN frequently brought utility representatives to Glasgow to see its product. PowerView is a commercially deployable product, although FPN customizes the name for each utility, e.g., Customer Choice and Control, Customer Choice 2000, etc.

Description: PowerView consists of four networks (see Figure A-5):

- Host Network -- PNP workstation that handles customer information and billing, facilities control, dispatch;
- Backbone Network -- Ethernet high-speed (T-1 or higher) fiber data line (LAN) connecting the Gateway to the utility;
- Distribution Network -- coax or fiber-coax cable connecting FPN's Intelligent Utility Unit (IUU) which handles four homes and FPN's Gateway which serves up to 500 homes in a 25-mile radius; and
- Home Network -- thermostat, user interface, HVAC controller, appliance relays, Powerlon meter, Echelon PLT-20 chip, and powerline carrier.

PowerView is a customer-controlled load management (CCLM) system provided through a CATV network. FPN does not produce all the components:

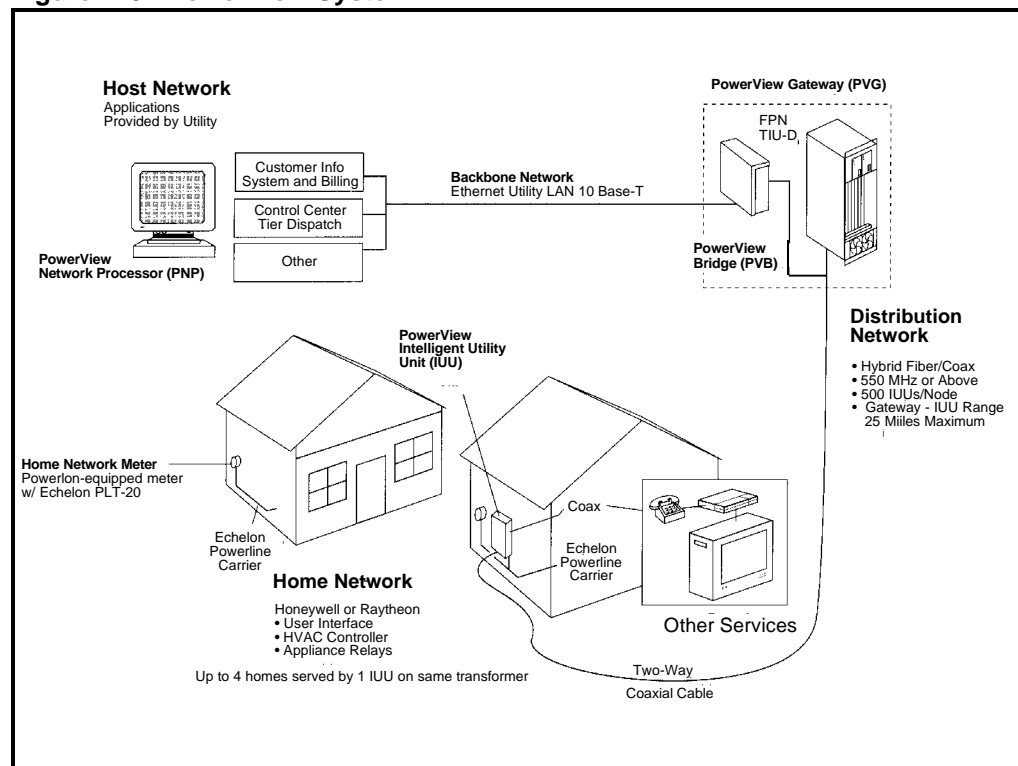
- Sun makes the PowerView Network Processor (PNP), a SPARCstation 5 system manager;
- American Innovation makes the electronic meters used at the homes for automated readings;
- Raytheon manufactures the thermostat, monitor, HVAC controller, and appliance relays; and
- Echelon produces the LONworks interface (chip), a "proprietary" closed standard chip that competes with the EIA-approved open standard CEBus chip.



Projects undertaken to date use the utilities' own fiber networks or leased lines.

- Features:
- Customers can preprogram operation of HVAC, water heater, and clothes dryer based on four real-time price periods--low medium, high, and critical.
  - Automated meter reading
  - Raytheon's Customer Energy Monitor is a hand-held calculator that can be plugged into any outlet in the home and displays one line of energy information; choices include temperature inside or outside, time and date, price in effect, vacation schedule, electric bill to date, and programmed response of each appliance.
  - Outages are reported automatically to utility through CATV, although not all utilities request this feature.
- Projects:
- Entergy began working with FPN on its pilot, but FPN is no longer working on the project.
  - Central and South West's pilot in 2,500 homes began in December 1994.
  - A pilot conducted by an affiliate of Southern Company (SDIG) in 303 multi-family units is expected to begin in early 1996.

Figure A-5. PowerView System



- Product:       TranstexT  
                  Advanced Energy Management System (AEMS)
- Developers:   Integrated Communications Systems (ICS)  
                  Southern Company  
                  Johnson Controls
- Investors:     Southern Company  
                  American Electric Power (AEP)  
                  Johnson Controls  
                  ABB  
                  American District Telegraph  
                  Bell South
- Background:   When TranstexT was originally tested in 1985 in Risewell, GA, it offered a variety of non-energy services via telephone--home banking, home shopping, classified ads, stock portfolio management, and cable TV--as well as energy information services. The costs of this service were prohibitive--\$5,000/home. During evaluation of the trial, customers responded that the most important feature of TranstexT was the energy management service. TranstexT was then reworked to focus on energy management, with plans to add on non-energy services in the future. AEMS is the demand-side management product ICS offers. AEMS was developed as a stand-alone product (i.e., no interface with distribution automation systems) with research and development assistance from Bell South and Southern Company, particularly for billing information and software.
- Description:   TranstexT and AEMS are energy management systems offered through the telephone and powerline carrier. ICS is the integrator, with ABB and Johnson Controls as key manufacturers of meters and thermostat components. Johnson's thermostat controller has low voltage wiring interface with major loads (HVAC, water heater, pool) and can handle frequent billing reports. ICS uses its own TranstexT major appliance relay (a two-way carrier programmed to be compatible with CEBus technology) and acts much like the X-10 plug adapters commercially available. The controller can handle up to eight addresses, and if each outlet has two plugs, then a total of 16 appliances can be controlled. At present ICS can handle only residential and small commercial customers with less than five-ton cooling loads. Automatic meter reading is provided. Other energy services can be offered, such as outage detection, if the utility sees an economic justification. Non-energy services have been considered by ICS but were disregarded because they could not compete cost effectively

with existing providers of security and other services. For example, the thermostat site is not the best location for an alarm “arm/disarm” pad. ICS could offer telephone service, but so far is not doing so.

- Features:
- Variable prices are programmed at one of four price designations -- low, medium, high, or critical. The customer responds with preprogrammed changes in appliance use. ICS has found that customers respond well to time of use pricing for HVAC, water heating, and pool heaters/pumps and have achieved real energy savings.
  - Alpha Meter is a fully electronic meter designed by ABB with three CEBus circuit boards inside to handle central processing, assign the appropriate tariff to blocks of electricity consumed, and report consumption and costs to the utility. This is not an electromechanical meter, and as such is less susceptible to electromagnetic pulse effects (Gulf Power is particularly susceptible to lightning).
  - TranstexT System Manager is a 486 computer controller that can handle up to 10,000 customers.
  - TranstexT Diagnostic Software is under development to permit a utility representative with a laptop computer to plug into an outside outlet at the home and access all appliance usage and billing data for a 40-day period.
- Projects:
- AEP’s pilot in 460 homes began in October 1990; the roll-out to 25,000 homes is expected to begin at the end of 1995.
  - Gulf Power’s pilot in 250 homes began in 1991; the roll-out to 30,000 homes is awaiting Public Utility Commission approval.
  - The developers are currently investigating opportunities at three other utilities, examining average and incremental production and delivery costs in a six-month screening process.

Product: UtiliNet

Developers: Metricom  
CIC Systems  
Landis & Gyr

Investors:

Background: Founded in 1985, Metricom manufactures profile meters that provide frequent readings for load control. In the early 1990s, Metricom developed its UtiliNet product line to provide high-performance, license-free, two-way wireless networks for electric utility applications in demand-side management and distribution automation. UtiliNet uses spread-spectrum radio in the 902-928 MHZ range. Based on Boston Edison's needs, Metricom forged a partnership with Landis & Gyr, whose meters could handle remote on/off functions but required a network to communicate. Based on PacifiCorp's needs, Metricom forged a partnership with CIC Systems, whose in-home energy management system can control HVAC and appliance use according to time or tariff. Metricom's UtiliNet product is installed in 17 electric and gas utilities to handle a variety of SCADA and automated meter reading (AMR) applications.

Description: Metricom's profile meters provide load control readings at intervals set by utility staff that are communicated to headquarters. Metricom's radios can work with Metricom or Landis & Gyr meters, depending on customer needs, as well as CIC in-home displays to permit customer-controlled load management. Metricom notes that it is difficult to justify the cost-effectiveness of AMR on a stand-alone basis; the value of the UtiliNet system is the combination of SCADA and AMR.

Features:

- Metricom's radios are intelligent devices that can execute a number of functions simultaneously: (1) interact with end-use devices to exercise data collection and control, (2) interact with the wider area network to facilitate network access, and (3) act as a repeater for all other radios in the network.
- Installation involves hanging a radio on a utility pole in a central location that permits communication via powerline to up to 100 customers. Utility linemen can hang the radio in eight minutes.
- Savings can accrue to customers by varying residential energy use through CIC displays or to utilities by capacitor bank switching through the UtiliNet radio network.

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- CIC displays present one line of energy information: current use in \$ or kWh, \$ or kWh used yesterday, month to date \$ or kWh used, last bill \$ or kWh, and usage history.
  - There are three light emitting diodes on the front of the CIC display to alert customers: (1) budget lights if actual usage exceeds budgeted consumption, although there are still bugs in this software, (2) time-of-use (TOU) peak lights 8 am to 5 pm, if the customer is a TOU participant, and (3) load control lights if the utility is directly cycling off water heaters.
- Projects:
- Pacific Gas & Electric reads a few hundred inaccessible Metricom meters in Vacaville, California.
  - Mid-American Energy's energy efficiency pilot with Metricom radios and profile meters extended from 1990 to 1994.
  - Boston Edison's pilot permitting remote on/off for 15,000 inaccessible meters began in 1991.
  - PacifiCorp's 100-meter pilot with Metricom radios and meters and CIC displays began in 1994.
  - Southern California Edison's has a project with 4,000 Metricom meters and 10,000 radios on capacitor banks.

*APPENDIX B*

## **Descriptions of Selected Utility Projects**

This appendix includes summaries of 21 utility projects based mainly on interviews with program managers conducted during August-October 1995. In several cases, we describe multiple projects that utilities are conducting if they met our criteria for this study. For each utility we include information on project team members and their roles, project description, target market, current status, energy and non-energy services offered or planned (indicated by an X or P), and regulatory issues. Staff at each utility had an opportunity to review and comment on our summaries during December 1995.

## APPENDIX B

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Utility: American Electric Power (AEP)  
Holding company for Appalachian Power, Columbus Southern Power, Indiana Michigan Power, Kentucky Power, Kingsport Power, Michigan Power, Ohio Power, and Wheeling Power.

Project: TranstexT Project  
For description of vendor product, see page A-17.

Team Members	Role	Responsibilities
AEP	Lead	Project direction, funding
Integrated Communications Systems (ICS)	Integrator	Equipment integration
Johnson Controls	Supplier	Engineering, thermostat, HVAC/appliance controls
ABB	Supplier	Engineering, Comset hardware, meter (standard & Alpha)
Southern Company	Software	Systems Manager software development

Description: The TranstexT project employs telephone communications between the utility and home and powerline carrier within the home. The pilot began in October 1990 and was scheduled to run for one year. AEP has continued the pilot, with 94% of original participants still involved. AEP has conducted several evaluations of customer satisfaction with the project. AEP and ICS partners are modifying equipment, upgrading the systems controller at utility headquarters, and installing enhanced Alpha meters at the pilot homes.

Market: The TranstexT project was originally a load shifting program, selecting all-electric residential customers with electric water heaters and heat pumps in both summer and winter peaking areas to participate in the pilot. At first, all participants had to be on the same telephone switch to facilitate communications with the utility. Three neighborhoods (460 homes) were selected, based on different weather and price tiers: Dublin, OH, Muncie, IN, and Roanoke, VA.

Status: As of September 1995, AEP is modifying the equipment in the pilot homes and at the utility. AEP plans to roll-out the project to 25,000 homes across the six states it serves by the end of 1998. In the roll-out, AEP will select areas where customers are expected to benefit most from participation. Not all areas have been selected; once selected, AEP will directly market customers by mail.

## Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information	Other
X			X	X	X	

Customers scroll through menu-driven screens on thermostats to see time, temperature, 40 days of billing history, bill to date in \$ and kWh comparing variable and standard tariffs so customers can estimate savings, predicted bill for month based on first 7-10 days, and kWh consumption by price tier. Prices range between 1-28 ¢/kWh in the various price tiers. Customers can control HVAC usage on weekday and weekend schedules by programming up to four time periods. Customers can also program up to eight appliances to respond to price or time signals using X-10 plug adapters and the Johnson Controls thermostat.

Non-Energy: No non-energy services are currently offered, but such services may be considered in the next generation of TranstexT (i.e., beyond the AEP roll-out).

Issues:

- AEP has kept respective public utility commissions informed throughout the pilot and does not expect problems during the roll-out or changes in funding sources for the project.
- AEP is also developing other in-house telecommunications technologies aimed at large commercial customers. The focus has been on handling large energy loads regardless of the telecommunications mode.

## APPENDIX B

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Utility: Baltimore Gas & Electric (BGE)

Project: Itron AMR  
For description of vendor product, see page A-7.

Team Members	Role	Responsibilities
BGE	Lead	Project direction, funding
Itron	Supplier	ERT meter modules, van radio
Various manufacturers	Supplier	Retrofit/recondition electric meters

Description: The Itron project will provide AMR and related services to 80% of the residential customers located within the Baltimore beltway (i.e., the densely populated areas) at substantial cost savings to the utility. The technology is currently configured for mobile radio readings. The meter retrofits have been simplified and 15,000 residential customers can join the program every month. BGE has 25,000 seed meters (from Landis & Gyr, Schlumberger, GE and a fourth manufacturer) that it has taken from homes and sent to the manufacturers for retrofitting with Itron ERTs and reconditioning. When BGE representatives come to homes, they break the circuit by lifting up the old meter, replace it with a retrofit meter, and plug the replacement meter back into the four-prong circuit. The installation takes less than 10 minutes. As meters are removed from homes, they are sent for reconditioning. If any meters are too old, they are replaced with new meters.

Market: The target market is all residential customers located in densely populated neighborhoods within the Baltimore beltway (695). Mobile Itron does not work well in rural areas where homes are set back from the road. If the van must drive up the driveway to read the meter, it may not be cost-effective to equip the home with a retrofit meter. BGE plans to retrofit 500,000 of the 700,000 gas and electric meters located within the beltway. In total, BGE has 1.3 million electric and 500,000 gas meters. Baltimore has high residential customer turnover because of the students and apartment dwellers, requiring 14,000-15,000 physical turn-on/off's each month.

Status: As of October 1995, BGE had installed 200,000 Itron ERTs. BGE plans to install Itron ERTs on all gas and electric meters within the beltway with 500,000 installed by the end of 1997.



## Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X					

Non-Energy: No non-energy services offered.

- Issues:
- BGE does not face any regulatory barriers with this project.
  - BGE staff believe that a variety of narrowband and one-way communication systems can meet most customer needs.

## APPENDIX B

Utility: Baltimore Gas & Electric (BGE)

Project: IRIS Fixed Network  
For description of vendor product, see page A-12.

Team Members	Role	Responsibilities
BGE	Lead	Project direction, funding
IRIS	Supplier	Meter modules (wireless radios), repeaters
Not Yet Determined	Supplier	Thermostat to control heat pump, A/C

Description: The IRIS pilot is testing a fixed wireless radio network for two-way communications with 100 residential meters in Timonium, Maryland. BGE is testing the viability of fixed wireless networks for automated meter reading and related services. Timonium has very hilly terrain, which provides a “worst case” scenario for testing a radio frequency network. Relatively low population density (2,700 meters per square mile in Timonium versus 20,000 meters per square mile in Baltimore) affects pole-top collector capacity and thus, the cost per meter ratio. BGE is collecting detailed load survey data on participants as needed by remotely activating the function. BGE is considering adding interactive thermostats to the pilot. Once real-time pricing is examined, commercial customers may be invited to participate.

Market: BGE deliberately chose a not-too densely populated residential neighborhood with uneven terrain to test the effectiveness and functionality of pole-top collectors (repeaters).

Status: BGE issued a Request for Proposals in Spring 1994 for a radio propagation, multiple application pilot. BGE was not interested in co-developing a product. IRIS/Motorola won the award and started the 100-meter pilot in Timonium in late 1994; the pilot was expected to continue for 15 months. If roll-out occurs, BGE may consider the area four miles outside the Baltimore beltway (i.e., the bedroom communities), including Laurel, Bowie, and Annapolis, for IRIS applications.

### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X	X		P	P	

BGE can change meter reading parameters remotely, choosing standard meter readings (once a month) or load survey readings for total usage (not disaggregated by end use) at

15 minute intervals. BGE does not yet use the IRIS system to bill these customers, but continues to require on-site verification of readings. The load survey readings give BGE an idea how to structure a real-time pricing mechanism desired by commercial and industrial customers. BGE would like to add on a smart thermostat to control heat pumps and air conditioners.

Non-Energy: No non-energy services considered in this pilot.

**APPENDIX B**

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Utility: Boston Edison

Project: Itron AMR  
For description of vendor product, see page A-7.

Team Members	Role	Responsibilities
Boston Edison	Lead	Project direction, funding
Itron	Supplier	ERT meter modules, van radio
Nscan	Supplier	Electronic board adapter on meter

Description: Boston Edison decided to automate meter reading because it has many inaccessible and hard-to-read meters in its service territory. Boston Edison also has a large student population with billing and shut-off problems. Itron equipment currently provides one-way AMR for 40,000 residential customers. Itron offers "virtual" remote on/off: the meter can be read at shut-off and start-up of power without having a staff person access the building to turn off the meter. Boston Edison uses two meter types: (1) Itron-adapted meters with a switch added that increases the height of the meter from 5.5" to 7", and (2) Nscan meters, which are the old meters with either an electronic board behind the nameplate or a flywheel on the shaft.

Market: Boston Edison does not have high sales volume per residential customer, which is one of the key criteria for automation projects. The Itron roll-out, underway for the past four years, will automate meter reading for residential customers in densely populated area.

Status: Approximately 40,000 customers had been connected to Itron wireless transmitters by the beginning of 1995 and 60,000 customers were expected by the end of 1995. Boston Edison issued a Request for Proposals (RFP) in May 1995 for telecommunications systems to provide multiple functions--AMR, service disconnect, load control, outage detection, and mode to communicate with customer (video, thermostat, etc.). Boston Edison is currently evaluating the proposals and is expected to issue an award for the pilot in the near future.

**Energy Services Offered**

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X		X			

Non-Energy: No non-energy services offered.

- Issues:
- The Massachusetts Public Utility Commission is very supportive of automation efforts. The gas utilities are three to four years ahead of Boston Edison (95% automated readings), and the water company also has off-site meter reading. At the beginning of 1995, 55,000 Boston Edison customer meters were automated and this was expected to increase to 75,000 by year end (both Itron and UtiliNet). This represents only 10% of the 600,000 residential customers in Boston Edison's service area. The need for proper billing, on a daily, weekly, or monthly interval, will probably drive automation.
  - Within two years, Boston Edison would like to interconnect the various automation projects that are underway, integrating Itron and Metricom services on the spare channels in the Motorola-Schlumberger wireless radio distribution automation network, thereby connecting distributed SCADA and billing functions.

## APPENDIX B

Utility: Boston Edison

Project: UtiliNet Automatic On/Off  
For description of vendor product, see page A-19.

Team Members	Role	Responsibilities
Boston Edison	Lead	Project direction, funding
Metricom	Supplier	Pole-top collectors, older meters, software, installation
Landis & Gyr	Supplier	New Meters, installation

Description: Boston Edison coordinated this project with assistance from Metricom and Landis & Gyr for installation, operation, diagnosis phases, and training of utility staff. Metricom hired one representative locally to provide service to Boston Edison on-site. The manufacturers still provide trouble-shooting assistance. The 15,000 meters communicate with 400 pole-top collectors. The ratio of homes to collector is 34:1 for Boston Edison, far below the 100:1 ratio specified by Metricom, because of distance, density, resistance, voltage, and LAN limitations. In suburban locations, the ratio is closer to 8-12:1. Boston Edison can read all of the hooked meters from a PC at its corporate headquarters. Boston Edison still faces one technical barrier--unexplained noise, which occurs around dinner time and causes the equipment to operate poorly. Boston Edison has relocated a few pole-top transmitters to eliminate this noise, but it may emanate from the homes.

Market: Boston Edison picked the Brighton neighborhood of Boston, where the concentration of college and university students is the highest. Problems with billing caused Boston Edison to consider automatic on/off and read-on-demand services for 15,000 meters.

Status: The pilot test is completed. Boston Edison is evaluating the project, compiling data and calculating on/off rates and operational savings.

### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X		X			

Boston Edison is not offering outage detection, due to its cost and redundancy. Most power outages are at the transformer, so receiving messages from 800 homes that power is down is not as important as knowing which transformer is down via SCADA. UtiliNet can identify sophisticated tampering by meter jumpers, which is significant for Boston Edison.

Non-Energy: No non-energy services offered.

- Issues:
- If Boston Edison rolls-out the project, it may chose to do so through an unregulated affiliate. The Public Utility Commission expects Boston Edison to assume all risks.

## APPENDIX B

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Utility: Central & South West (CSW) Corporation  
Holding company for Central Power & Light, Public Service Company of Oklahoma, Southwestern Electric Power, and West Texas Utilities

Project: Customer Choice and Control  
For description of vendor product, PowerView, see page A-15.

Team Members	Role	Responsibilities
CSW Communications, Inc.	Lead	Project direction, cable installation, software, funding
First Pacific Networks (FPN)	Supplier	Intelligent Utility Unit, Eshelon chip, Networks
Raytheon	Supplier	Engineering, Customer Energy Monitor, installation
American Innovation	Supplier	Electronic meter

Description: In February 1994, CSW announced a \$9 million joint research project among its four retail electric operating companies for fiber-optic energy management. Customer Choice and Control is a product co-developed by CSW and FPN (CSW is an equity owner of FPN). CSW installed hybrid fiber cable in 10 neighborhoods in Laredo, Texas that passes roughly 2500 homes. As of December 1995, CSW has signed agreements with to participate with about 1700 households, about 70% of the customers that the fiber cable passes. CSW is not offering CATV or other non-energy services, but is focusing on energy management (i.e., testing customers ability to shift load given control over their electricity usage). Equipment installation did not begin until December 1994. Participants can control use of air conditioners, water heaters, and clothes dryers in response to an experimental time-of-use rate tariff with four periods that was approved by the City of Laredo. Rates range between 5.5 and 50 ¢/kWh. CSW is using an in-home display unit developed by Raytheon in the pilot (rather than set-top box). CSW is very active in customer outreach, maintaining an 800 number for inquiries, preparing a video, and publishing a regular newsletter.

Market: The residential market in Laredo, Texas, was targeted because of its (1) fast growing economy, (2) severe peaks due to hot weather, and (3) isolation from nearby generation plants. CSW would like to avoid building new generation and transmission and distribution facilities near Laredo and is hoping that this project will shift a sufficient load to avoid such investments. CSW marketed Laredo by telephone and by speaking at neighborhood and school meetings; a variety of single and multi-family homes were selected. CSW keeps participants updated with a newsletter. Focus groups are held to assess customer interest in participation.



**Status:** As of December 1995, all necessary equipment has been installed in about 625 homes. Based on initial experience in the pilot, CSW has initiated a number of improvements to vendor products and plans to roll-out the technology beyond Laredo. For example, FPN's Intelligent Utility Unit (IUU) will be able to serve up to four homes in the updated version of PowerView technology. Pilot participants will continue to use their equipment after December 1995. CSW reports that customers, on average, are saving about 7-10% on their electric bills and claims that the utility is reducing peak demand by about 2 kW in participating homes. Currently, system costs are roughly \$1800/home in the latter phases of the pilot and CSW believes that a cost target of \$1000/house is achievable in the near future.

**Energy Services Offered**

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X	P		X	X	X

Customers are provided with in-home bill-to-date queries. CSW has identified outage detection and itemized bills for major appliances showing costs for usage in the various time-of-use price tiers as features for later inclusion.

**Non-Energy:** No non-energy services offered in this pilot.

**Issues:** • The Texas Public Utility Commission has been very supportive of this project. CSW expects no problems obtaining approval for a territory-wide time-of-use rate.

## APPENDIX B

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Utility: Entergy  
Holding company for Arkansas Power & Light (AP&L), Louisiana Power & Light, Mississippi Power & Light, and New Orleans Public Service

Project: Customer-Controlled Load Management (CCLM)  
For description of vendor product, PowerView, see page A-15.

Team Members	Role	Responsibilities
Entergy	Lead	Project direction, cable/equipment purchases/installation
Echelon	Supplier	Eshelon chip
Honeywell	Supplier	Engineering, Thermostat in-home display
American Innovation	Supplier	Turnkey retrofit meters
Sprint	Supplier	Long-distance telephone service

Description: Customer Choice 2000 was co-developed by Entergy and First Pacific Networks (FPN) in 1990. Entergy held equity interest in FPN and Entergy Enterprises, the unregulated subsidiary that was responsible for the project. Entergy recently spun this project off to the regulated subsidiary's Marketing Department. FPN is no longer working on the project, in part because of problems and delays that arose during implementation. Entergy has renamed the project Customer-Controlled Load Management (CCLM) and is implementing a pilot in 50 homes in Chenal Valley, Arkansas, working directly with vendors. A Dell 486 CPU (no monitor) is installed in the attic or garage of each home to communicate with the thermostat, meter, repeater, and ultimately a controller at AP&L's headquarters.

Market: Entergy's electricity prices are among the highest in the South. Originally, Entergy wanted real-time access to customers in areas with severe weather where electrical equipment needed to be shut down. Entergy initially chose New Orleans for participation in the project in 1990, but encountered significant regulatory problems. Entergy then selected Chenal Valley, Arkansas, as its trial neighborhood due to high disposable income and a sophisticated substation.

Status: As of September 1995, equipment had been installed in over 40 homes. Entergy plans to complete equipment installation by January 1996 and to continue the pilot with a new variable tariff through January 1997. Entergy does not expect a roll-out after the pilot.

## Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X			X	P	X

Customers can control HVAC, water heater, and two additional appliances with a sophisticated set-back thermostat. Time-of-use pricing awaits regulatory approval of a variable tariff.

## Non-Energy Services Offered

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
		X		X		

Entergy offers 22 CATV stations and may start a channel focusing on energy efficient products and home improvement. Participants have an A/B switch atop the TV to select Comcast or Entergy CATV channels. Sprint currently provides long-distance telephone service.

Issues:      • The Arkansas PUC has been slow to approve time-of-use tariffs and unwilling to let ratepayers finance this project.

## APPENDIX B

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Utility: Glasgow (Kentucky) Electric Plant Board  
Municipal utility wholly dependent on Tennessee Valley Authority (TVA)

Project: TVA Water Heater Project

Team Members	Role	Responsibilities
Glasgow Electric Plant Board	Lead	Project direction, cable/equipment purchases/installation
TVA		Funding
CableBus	Supplier	Engineering, CTD terminal, meter retrofit relay/counter

Description: In 1988, Glasgow began constructing broadband fiber network to provide SCADA and telecommunications services (e.g., cable TV service). Currently, Glasgow is the lead on a water heating project, setting product specifications for manufacturers and coordinating this project with the web of non-energy telecommunications services implemented since 1989. Initially, Glasgow did not offer energy management services through its cable network because TVA would not authorize a time-differentiated wholesale rate that would make participation in such a project cost-effective for Glasgow customers. This situation changed when TVA created a 2.7¢/kWh tariff in effect after midnight for water heating. The TVA water heater project will test if residential customers are willing to heat water at night and coast with what is in the tank for the rest of the day. Under this tariff, Glasgow can compete with gas-heated water charges, and possibly gain new electric water heater customers. The TVA water heater project involves hooking up a cable drop to the electric meter outside the home, which is retrofit with a revolution counter, a switch to read water heating use, and a CTD terminal (6" x 8" box).

Market: Glasgow sought 100 residential customers with electric water heaters through advertising on its cable TV network. The utility had trouble finding 100 homes with electric water heaters and ended up with only 50 homes to participate in the pilot.

Status: As of October 1995, Glasgow is evaluating the performance of equipment which has been installed in several homes with electric water heaters. If successful, the equipment will then be installed in the remaining homes that are participating in the pilot. The off-peak TVA discount tariff is in effect and testing is expected to continue for 18 months.

## Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
P				X	

Glasgow would like the automated meter reading system to be interconnected with the cable network and to report meter readings to the workstation.

## Non-Energy Services Offered

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Home Security
X		X		X	X	P

Glasgow provides cable TV to 3,000 subscribers, offering 49 channel basic service option for \$13.50 per month. In 1994, Glasgow began offering local telephone service in direct competition with the local exchange provider (GTE). Glasgow also offers access to a local area network (2 MB/second), called HomeLan, which allows users to access the Internet access, email, and access educational information kept at local schools and libraries. Several hundred customers take advantage of local telephone and LAN services. Glasgow plans to add security services via CableBus, with signals for home break-ins transmitted over the cable network to a monitoring station.

- Issues:
- As a municipal utility, Glasgow is unregulated at state level and not subject to restrictions by the Public Utility Holding Company Act of 1935. Thus, Glasgow has been able to expand its service offerings to compete against cable and telephone providers.

## APPENDIX B

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Utility: Gulf Power  
One of five subsidiaries of Southern Company.

Project: Advanced Energy Management System (AEMS)  
For description of vendor product, see page A-17.

Team Members	Role	Responsibilities
Gulf Power	Lead	Project direction, funding
Integrated Communications Systems (ICS)	Integrator	Hardware/software integration
Johnson Controls	Supplier	Engineering, thermostat, HVAC/appliance controls
ABB	Supplier	Engineering, Comset hardware, meter (standard)
Southern Company	Software	Systems Manager software development

Description: AEMS employs telephone communications between the utility and home and powerline carrier within the home. Gulf Power's pilot project has been underway since 1991, with two full years of testing (1992-1994) under a variable TOU pricing schedule. The project succeeded in shifting customer load and enhancing the customers' perception of the value of controlling their own energy use and bills. Gulf Power is capacity constrained during summer peak periods. Time-of-use pricing provides customers with a way to modify their electricity use considering both cost and comfort and avoiding further utility investment. Based on an independent evaluation, Gulf Power reports that customers reduced their average bills by about 2% during summer and 13% during winter and the utility realized a load reduction of about 2.25 kW/home during its summer peak period (Gulf Power Company 1994).

Market: Gulf Power targeted large electricity-intensive single-family homes (18,000-24,000 kWh/year) with one telephone switch. Gulf Power mailed out an invitation to customers in Gulf Breeze, Florida (a suburb of Pensacola) to participate in the pilot and received a 20% response rate. Gulf Power randomly sampled from the responses, selecting 240 homes, plus 200 for a control group. The control group homes received an ABB meter that could store up to 40 days of data on energy usage; no other equipment was installed on the premises. The test group homes received all equipment.

Status: As of September 1995, Gulf Power was awaiting Florida Public Utility Commission (PUC) approval for full program roll-out to 30,000 customers.

In support of its filing, Gulf Power prepared a report documenting the pilot during 1992-1994, complete with select findings from focus groups of participants held in 1994. ICS may not be the provider of the roll-out system; Gulf Power is about to issue a Request for Proposals specifying its functional requirements (e.g., tiered variable pricing and types of equipment on premises) to see if another vendor offers a superior package.

#### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X	P			X	

Automated billing is offered. Energy information is limited to 40 days of billing data available at the meter.

Non-Energy: No non-energy services were offered during the pilot; Gulf Power may consider such services for the roll-out.

Issues:

- Because the utility is capacity constrained, the PUC established certain peak demand reduction goals for Gulf Power during its 1994-1995 filing.
- Gulf Power plans to test fixed-point wireless radios during the roll-out in order to broadcast a critical price to more than 10,000 customers simultaneously.

## APPENDIX B

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Utility: Hydro Quebec

Project: Universal Bidirection Integration (UBI)

Team Members	Role	Responsibilities
Hydro Quebec	Lead	Project direction, funding
Zenith Corp.	Supplier	Cable set-top box
C-Mac	Supplier	Electronic thermostat
Domosys Lab	Supplier	CEBus chip, programming

Description: UBI is a comprehensive information highway project that will offer energy management, home automation, and other new services to residential customers. Key team members in the joint venture include Hydro Quebec, the Canadian postal service, Lotto Quebec, National Bank, and Videoway. There have been many technical problems and team members (approximately 100 service providers, from Sears to Pizza Hut). UBI will test electronic offering of mail, lottery tickets, video games, banking, energy billing, general information, and service purchasing.<sup>1</sup> As part of the larger UBI project, Hydro Quebec will test the magnitude and timing of load shifts and energy savings realized by customers in a well-to-do neighborhood almost completely dependent on electricity. Hydro Quebec is setting up a telephone-based automated meter reading project for 440 homes in Chicotimi. All 440 homes will receive an electric meter that collects data on hourly usage and automatically dials Hydro Quebec each day to report 24 hours of data; 330 homes will receive CEBus chips to monitor two wall switches and two plug loads in addition to the baseboard electric heaters. The thermostats and CEBus devices will respond to time (not price) triggers.

Market: A statistical sample was drawn from 3,000 Chicotimi homes, identifying customers with no plans to move within the next two to three years and with considerable electric loads--baseboard heaters, water heaters, air conditioners, pool heaters, and block heaters for cars (which draw 700 watts per hour and are plugged in all night to carport or driveway outlets). Hydro Quebec selected 440 homes; 330 homes will be hooked up with all equipment and 110 homes will be metered as a control group.

Status: UBI has been in the planning stages for more than one year. The 110 homes will receive meter hookup in October 1995 so that the winter of

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<sup>1</sup> For example, Canada Post will test electronic mail services, the National Bank of Canada will offer home banking services, while Lotto Quebec will provide electronic purchasing of lottery tickets.



1995-1996 can serve as a baseline reference. Beginning in September 1996, the 330 homes will be hooked up with meters, thermostats, and CEBus chips, and monitoring will begin in the winter of 1996-1997.

#### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
P			P	P	P

Hydro Quebec plans to offer time-responsive customer-load control, automated meter reading, and billing. If the larger UBI project moves forward, services offered will include electronic billing and payments (through the set-top box with a card reader and small ribbon printer), appliance control via CEBus chips, general energy information, and ordering from Hydro Quebec's publications catalog (e.g., pamphlet Before You Dig, etc.).

#### Non-Energy Services Offered

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access
		P	P		P

Hydro Quebec is not offering non-energy services in this phase of pilot. If the larger UBI project moves forward, participants will be able to send electronic mail, purchase lottery tickets, perform banking transactions, and receive two-way communications through a cable box.

Issues:      • No regulatory barriers are anticipated as principal UBI team members include government-owned entities.

## APPENDIX B

Utility: Kansas City Power & Light (KCPL)

Project: CellNet Pilot  
For description of vendor product, see page A-2.

Team Members	Role	Responsibilities
KCPL		Project direction, funding
CellNet	Lead	Meter modules, CellMasters, installation, operation

Description: KCPL is in the midst of a phased-in, system-wide roll-out of automated meter reading and distribution automation using the CellNet system. The entire roll-out is scheduled to be completed in early 1997. Current objectives are to (1) automate many customer and distribution functions without laying off any of the < 60 meter readers (KCPL intends to offer retraining to move meter readers into other positions), (2) guarantee system operation regardless of power outages, (3) design rate structures to accommodate customer usage, and (4) ultimately automate outage restoration functions with a voice response unit alerting homes and businesses when power will be restored.

Market: KCPL started geographically in Johnson County, Kansas, with 5,000 meters and 60 capacitor banks in early 1995. Currently, system is being deployed throughout the service territory to residential and C/I customers. CellNet established a retrofit center in Kansas City, employing 12 people, who install the meter devices.

Status: In August 1994, KCPL signed a 20-year agreement with CellNet to install and operate the metering system. In Phase 1, 5,000 meters were installed between January-March 1995; in Phase 2, 75,000 meters will be installed by December 1995; and in Phase 3, 340,000 meters are planned to be installed by December 1996. All CellMasters (pole-top data collectors/transmitters) have been installed and the new billing system is being tested in parallel with the existing system for 17,000 customers in one district.

### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X	X			P	

KCPL is currently deploying time-of-use pricing on a test basis. Smart bill, a concept for computer- and modem-equipped customers, is also being examined.

Non-Energy: KCPL is investigating home security and other non-energy offerings because only 25% of the CellNet capacity will be used by automated meter and related energy services when the system is fully deployed. CellNet recently announced that it will test home security services at the end of 1996 through an alliance with Interactive Technologies Inc. (ITI) (Energy Services & Telecom Report 1996c).

- Issues:
- KCPL does not expect any regulatory barriers, even though the utility never had a variable tariff approved, nor does it anticipate union problems since all displaced meter readers will be retained in other capacities.
  - KCPL expects that some customers in sparsely-populated areas will need a different automated meter reading system without a central pole-top collector. A number of systems are under study for eventual linkage with CellNet.

## APPENDIX B

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Utility: Pacific Gas & Electric (PG&E)

Project: CellNet Pilot  
For description of vendor product, see page A-2.

Team Members	Role	Responsibilities
PG&E	Lead	Project direction
CellNet	Supplier	Meter modules, installation

Description: PG&E assisted CellNet with development of its meter module, permitting early demonstration of CellNet equipment on 1,700 meters and 100 distribution feeder points. The meter module is an electronic switch installed behind the nameplate inside the meter's protective glass.

Market: PG&E selected residential customers in two locations in California.

Status: The pilot began in 1990 as a research and development project and was completed in 1993, with PG&E's Operations Department absorbing responsibility for all automated meter reading locations.

### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X					

Non-Energy: No non-energy services were offered.

Issues:

- The California Public Utility Commission is supportive of PG&E's telecommunications pilots.
- In September 1995, PG&E issued a Request for Proposals (RFP) for automation of the utility's 8.2 million gas and electric meters (all customer classes). The RFP was sent to 25 different vendors. PG&E is particularly interested in automating hard-to-read meters (e.g., inside buildings, in locked rooms, or located in geographically challenging areas), dangerous-to-read meters (e.g., in housing projects or other areas where PG&E meter readers always go accompanied), and time-of-use meters. The utilities have not announced final award, in part because of regulatory uncertainties associated with their future role and obligations in this area in a restructured electricity industry.

Utility: Pacific Gas & Electric (PG&E)

Project: Energy Information Services (EIS) Trial  
For description of vendor product, see page A-15.

Team Members	Role	Responsibilities
PG&E	Co-lead	Project direction, CEBus chip programming, funding,
TeleCommunications Inc. (TCI)	Co-lead	Cable installation/hook-ups, set-top box, funding
Microsoft	Co-lead	Operating system, funding
Landis & Gyr	Supplier	Meter, HVAC controller
Ademco	Supplier	Home security
Andersen Consulting	Consultant	Affiliate program administrator

Description: This project incorporates automated meter reading, demand-side management (DSM), and energy information services with home automation and home security via broadband communications. The objectives of the project include: (1) testing customer reactions, (2) determining customer value for services, and (3) documenting internal PG&E costs and DSM savings. PG&E shareholders committed about \$6.2 million for the project.

Market: PG&E and TCI wanted a variety of customers involved in this trial. Phase 1 consisted of laboratory, alpha testing, and “friendly” installations. In Phase 2, 50 Walnut Creek and 50 Sunnyvale homes will participate. An invitation was mailed out to all customers in Walnut Creek and Sunnyvale offering the EIS services. The response was good; a screening process was used to select the 100 participants. Walnut Creek was selected for its upper middle class customers, many pools and air conditioners, and temperate climate. Sunnyvale was selected because of its coastal climate and the variety of single and multi-family homes. No prior cable hook-up was required although most homes were already wired. Participation in the trial is free to customers, as shareholders are bearing all costs. When the trial enters Phase 3, 1,000 homes will be linked in these two neighborhoods as well as selected other neighborhoods offering different demographics.

Status: This is a three-phase project: (1) Phase 1 began in October 1994 with a trial agreement among all parties, access to PG&E employees homes to test out technologies, software development via CEBus, and integration, (2) Phase 2 began in June 1995 and will continue through mid-1996 with 50 Walnut Creek and 50 Sunnyvale residences, and (3) Phase 3 will begin in

## APPENDIX B

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mid-1996 with an expansion of tested and improved services to 1,000 homes.

### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X			P	X	X

Phase 2 offers customers customer-controlled load management of five electric appliances (pre-programed response of HVAC, refrigerator, dishwasher, range, and dryer to price signals), real time usage updated every 20 seconds (allows customers to see how much it costs to run each appliance), bill segregation (allows customers to see bill by appliance and price tier), and other energy information. In Phase 3, the customer-controlled load management will handle up to four price signals and electronic billing and payment may be offered (with credit card pin code via a set-top box).

### Non-Energy Services Offered

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
P						P

PG&E plans to test home automation applications (lighting control - program timers on up to two lights) and home security (working with Ademco Corp. to link an alarm control panel, HVAC controls, and the cable set-top box).

Issues:      • PG&E hopes that regulatory restructuring issues will be resolved by 1997 to permit the packaging of energy information systems for implementation by PG&E and other utilities.

Utility: PacifiCorp  
Mega-Utility operating in California, Idaho, Oregon, Utah, and Wyoming

Project: UtiliNet  
For description of vendor product, see page A-19.

Team Members	Role	Responsibilities
PacifiCorp	Lead	Project direction, funding
Metricom	Supplier	UtiliNet, radios, engineering, installation
CIC Systems	Supplier	In-Home energy management system

Description: In response to Oregon Public Utility Commission (PUC) requests, PacifiCorp has undertaken a pilot to examine residential customer response to variable pricing and energy information provision. The pilot program will begin data gathering before the end of 1995 with over 100 customers and 12 utility substations that are connected in a wide area network (WAN) in Portland, OR. This pilot involves automated meter reading, outage detection and restoration through SCADA, and personalized billing and real-time energy usage from the CIC in-home display. PacifiCorp worked closely with vendors to develop equipment and software to meet its needs. PacifiCorp put out a competitive bid, limiting the communications interface to wireless radio technology, which was won by Metricom. As the project evolved, the PUC made a second request that the utility test consumer responses to time-of-use pricing and receipt of energy information. To address these requests, an in-home display unit was required and CIC Systems was brought on board.

Market: The project originally targeted 800 customers, but has since been revised downward to 200 customers. These customers are in older homes located at the end of one feeder in one corner of the Oregon service territory, which allows the utility to easily track energy usage. PacifiCorp mailed out a letter to interest potential participants, and received 65 responses. PacifiCorp then went door-to-door and the response was excellent, even without offering incentives.

Status: Since July 1994, five prototype Metricom systems are under beta testing; four remain operational. As of September 1995, installation of the remaining units remains incomplete. Fifty CIC in-home displays have been installed (100 were purchased). The Metricom meters have been installed for all participants, but communications with PacifiCorp has not been finalized for five participants due to transformer confusion. The time-of-use rate participants are not yet set and may not be until the end of

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1995. PacifiCorp would like to see the project expanded, but their budget was deferred.

### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X				X	X

PacifiCorp could perform direct load control and appliance monitoring through CIC displays, but is not doing so. Remote disconnect is available through Landis & Gyr meters; PacifiCorp has 100 Landis & Gyr meters for a different project at a high-rise apartment complex with turnover problems. PacifiCorp is considering broadcasting ASCII text messages to customers to notify them of outages, demand-side management equipment sales, etc.

Non-Energy: No non-energy services offered.

Issues:

- PacifiCorp is examining a range of technologies, from one-way Itron meter switches to satellite solutions.
- The economics for this project are relatively poor because the customer-to-transformer ratio is low throughout the service territory, typically 2:1. In dense areas like Portland and Ogden, the ratios are higher, permitting wireless radio options.



Utility: Public Service Company of Colorado (PSC)

Project: AMR Project  
For description of vendor product, see page A-7.

Team Members	Role	Responsibilities
PSC	Lead	Project direction, funding
Itron	Supplier	ERT meter modules, installation, van radio, collectors
Various manufacturers	Supplier	New electric meters

Description: PSC signed a \$23-million contract with Itron to install transmitters on gas and electric meters in the Denver area. This project is an AMR roll-out to all customers. As currently configured, the AMR permits one-way drive-by reading only. In June 1995, PSC installed 10 Itron pole-top collectors in a pilot to test a fixed AMR network in Denver. Ultimately, PSC would like to install 11,000 pole-top collectors in a roll-out to read all meters in Denver. By March 1996, PSC will decide whether to go with a fixed wireless network, permitting outage detection, time-of-use pricing, medical alert, and other energy and non-energy services to be offered. The billing system was already upgraded two years ago.

Market: The pilot for 1,500 inaccessible meters ran in 1993. PSC issued a Request for Proposals and Itron won the award for a phased roll-out to all PSC electric and gas customers.

Status: As of October 1995, 300,000 meters had been retrofitted with plans to complete installation for all 1.35 million electric and gas customers by December 1997. Simultaneously, PSC is upgrading customers' electric meters, with plans to install up to 500,000 new electric meters by December 1997.

#### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X	P			P	

Actual provision of services beyond AMR will not be detailed until the fixed network pilot is underway in early 1996.

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**Non-Energy Services Offered**

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
	P					P

Issues: With respect to other information/communication services, PSC made headlines when it awarded a 10-year contract for its data and communications systems to Integrated Systems Solution Corp. (ISSC), an outsourcing unit of IBM. ISSC controls the customer information system and could provide its own protocol to facilitate data capture/processing from PSC projects.

Utility: Public Service Electric & Gas (PSE&G)

Project: Integrated Broadband Utility Solution (IBUS)  
For description of vendor product, see page A-9.

Team Members	Role	Responsibilities
Public Service Electric & Gas (PSE&G)	Co-Lead	Project direction, funding, Legacy system
Lucent Technologies (formerly AT&T)	Co-lead	Program integrator, funding, software development
Intellon	Supplier	CEBus chips, engineering
Honeywell	Supplier	Total Home EMS 2000 thermostat and load controllers
General Electric	Supplier	New Meter (CM21P single-phase), CEBus compatible
American Meter	Supplier	Gas and water meter wireless AMR modules
Andersen Consulting	Consultant	Market research, business development

Description: Lucent Technologies, formed as a result of the trivestiture of AT&T, and PSE&G co-developed IBUS. The IBUS project features an interactive, bi-directional communications system which, in New Jersey, utilizes a hybrid fiber-coax cable connection between the utility and the network node and power line carrier technology between the home and a utility intelligent unit (UIU). The IBUS project features two-way communications all the way to the premises as well as “open” communication standard protocols. Garden State Cable provided cable access during the 10-home proof-of-concept and will provide cable access for the 1,000-home customer pilot. PSE&G is leasing the bandwidth for the 1,000-home customer trial. In the 1,000-home technical trial, Honeywell thermostats will be used as well as a mix of meters provided by General Electric and American Meters.

Market: The proof-of-concept tests took place in Moorestown, NJ, because Garden State Cable had two-way hybrid fiber-coax cable laid there. The 1,000-customer pilot is planned for Evesham township (Marlton, NJ) in Burlington county. Evesham was selected because it has a mix of facilities--condos, apartments, single-family homes, and small commercial facilities. A few industrial customers in Bellmawr, NJ and Moorestown, NJ will also be included in the 1,000-customer pilot.

Status: PSE&G and Lucent Technologies signed a contract to co-develop the IBUS technology in January 1995. Phase 1 involves a three-year development to test proof-of-concept; installations were completed

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between January-March 1995. Phase 2 involves technical tests and the installation of 20 units beginning in December 1995, followed by installation of 980 units which should be completed by the end of May 1996. Phase 3 involves a 5,000-point early roll-out beginning in the first quarter of 1997. The roll-out is expected to reach 105,000 customers by the end of 1997; 100,000 customers will be added for the next four years until PSE&G has completed 505,000 installations.

### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X	X	X	X	X	X

In the proof-of-concept test, PSE&G demonstrated wireless automated meter reading for electric meters through powerline carrier and direct load control. In the 1,000-customer pilot, PSE&G will add real-time pricing in approximately 40 homes, load reduction evaluation, utility-controlled load management, remote on/off, customer information messaging, theft-of-service detection, TOU metering, customer load profile for electric and gas use, emergency gas curtailment, and distribution automation.

### Non-Energy Services Offered

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access
P	P				

In the third phase of the project, PSE&G is considering testing several non-energy services (home security, medical alert, home automation).

Issues:      • PSE&G already has a TOU rate and does not expect regulatory problems.

Utility: Southern Development Investment Group (SDIG)  
Unregulated subsidiary of Southern Company, the holding company for Georgia Power, Alabama Power, Gulf Power, Mississippi Power, and Savannah Electric & Power

Project: Dominion Project  
For description of vendor product, PowerView, see page A-15.

Team Members	Role	Responsibilities
SDIG	Lead	Project direction, cable/equipment installation, funding
Georgia Power	Contractor	Master metering
Dominion (real estate developer)	Owner	Builder of new apartment rentals, funding
First Pacific Networks (FPN)	Supplier	Intelligent Utility Unit, Eshelon chip, Networks
Raytheon	Supplier	Engineering, Customer Energy Monitor
American Innovation	Supplier	Turnkey retrofit meters
Landis & Gyr	Supplier	New electronic meters

Description: SDIG has contracted for trial deployment in an upscale apartment complex with FPN for its PowerView product. SDIG does not have an equity interest in FPN. The Public Utility Commission recently approved SDIG's application (filed two years ago) to operate as an unregulated subsidiary with its authority expanded beyond research and development. SDIG undertook this project to reduce Georgia Power's summer peak, which breaks records every year. In partnership with a cable provider, Southern is wiring the apartments participating in the pilot with coaxial cable as they are built. Energy usage and savings will be monitored from Georgia Power's headquarters.

Market: All-electric, new construction, multi-family homes were targeted. A 14-building, 303-unit complex under construction by Dominion in Duluth, Georgia (a suburb of Atlanta), was selected. Georgia Power is not capacity-constrained, but is interested in reducing its 13-GW swing between peak and off-peak summer loads.

Status: As of October 1995, SDIG has not yet issued an official press release and would not identify all partners. The first apartment building is under construction, with occupancy slated for January 1996. Subsequent buildings will be ready in April 1996 and the pilot will continue through June 1998.

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**Energy Services Offered**

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
P	P			P	P

This residential project is the first to offer real-time pricing to control HVAC and water heating use. Dominion pays one monthly bill to Georgia Power, which has a special master metering contract to read and prorate electricity use by apartment.

**Non-Energy Services Offered**

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
P	P	P	P		P	P

SDIG will provide video monitoring of all public spaces in the apartment complex and home security from project inception; other services will be available during the course of the pilot. SDIG is investigating long-distance telephone service provision.

Issues:      • This project is being conducted by an unregulated subsidiary, in part to avoid potential regulatory problems.

Utility: TeCom Inc.  
Unregulated subsidiary of TECO Energy, the holding company for Tampa Electric (TECO)

Project: TEMS

Team Members	Role	Responsibilities
TeCom Inc.	Lead	Project direction, funding, software development
M-TEL	Supplier	Wireless radios

Description: The objectives of this R&D pilot are to (1) design an open architecture system that can run on any customer's personal computer (PC), (2) use over-the-counter equipment (e.g., X-10 adapters), and (3) provide fully functional value-added services to customers and the utility alike. TeCom's primary focus is with residential customers, although it plans to expand the project to commercial and industrial customers. A variety of energy and non-energy services will be offered. TeCom is designing a touch screen device to perform both the thermostat and terminal functions for those who do not have personal computers.

Market: The initial phase of the pilot is being conducted in the homes of "friendly" participants: TeCom selected 150 employees in Tampa Electric's service territory. Selected employees reflect various demographic groups. TeCom is particularly interested in testing creative tariffs. TeCom has designed software to run on any PC platform and, as the pilot rolls out, expects that early adopters will use their own PCs.

Status: Development work began in 1991, with planning and testing of prototype equipment and protocols taking place in a few homes. The pilot began in earnest in June 1995. As of December 1995, about 140 homes had received installations. During the second phase, which is scheduled to begin in the first quarter of 1996, additional services will be added, such as a smart thermostat, Internet access, two-way wireless paging, and entertainment. TeCom regularly mails out a newsletter, TEMStalk, to all participants, informing them of all developments.

#### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information	Other
X			X	X	X	X

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TeCom offers (1) customer-controlled load management of up to 17 devices (HVAC, pool pumps, heat pumps, A/C, water heaters, stoves, dryers, and other appliances, whether switches or plugs), (2) submetering of four or eight appliance loads, (3) detailed energy information obtained at 30-second intervals that is used to forecast actual month's bill and test which creative tariff would save the customer the most money, and to monitor appliance use, etc., (4) AMR at 15-minute intervals, and (5) TOU creative rate testing.

### Non-Energy Services Offered

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
P	P				P	P

TEMS plans to offer Internet access and entertainment services during the second phase. Ultimately, TEMS will offer two-way paging, home security, and in-house medical monitoring, among other services.

- Issues:
- TECO received approval of its time-of-use residential rate from the Florida PSC and expects no regulatory problems.
  - TEMS is providing some innovative telecommunications services, and the company has been approached by other utilities about these services.



Utility: Virginia Electric Power (VEPCO)

Project: Cable-based Energy Management System  
For description of vendor product, see page A-4.

Team Members	Role	Responsibilities
VEPCO	Co-developer	Engineering, installation, funding
Cox Communications	Lead	Project direction, cable installation, software development
Northern Telecom (Nortel)	Co-developer	Software/CEBus programming, box development

Description: Cox coordinates the project and provides the cable infrastructure. Nortel is developing and supplying the integrated box for voice, data, and video communications. VEPCO is negotiating with suppliers of meters, home display devices, and integration software.

Market: Participants in the trial include VEPCO and Cox employees in Virginia Beach and Norfolk, VA, where Cox already has hybrid fiber/coax cable in place. It was difficult finding employee participants because Virginia Beach is an exclusive neighborhood and Norfolk is relatively poor, while most of the utility and telecom employees are middle class. All participants will be equipped with some energy monitoring; there will be no control group to test savings. Originally, 48 homes were desired, but only eight VEPCO employees and 36-40 Cox employees will participate.

Status: The project officially started in May 1995. As of October 1995, bench tests with communication systems were completed; technical details have not yet been fully resolved. Phase 1 will be underway once all equipment is installed in the pilot residences in December 1995. An initial set of energy services will be offered, with additional services added over time. The trial is expected to continue for one and one-half to two years from May 1995.

#### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information
X	X		X	P	P

Energy services are being phased in by VEPCO: automated meter reading, outage detection, and electronic billing in Phase 1, followed by testing CEBus-adapted devices

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in the home; TOU pricing and energy information in Phase 2; and power quality with additional meters per home in Phase 3.

### Non-Energy Services Offered

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
		P	P	P	P	

Cox plans to offer video on demand (switched cable) and Nortel plans to offer Internet access and telephone via CATV. These services may not be offered until late 1997.

- Issues:
- The Virginia Public Utility Commission (PUC) has been very cooperative; thus far, the project has been viewed as an R&D activity.
  - VEPCO does not want to petition PUC for rate clearance until the technology trial is successful. VEPCO has an experimental residential peak rate available, but will probably not use it in this pilot.

Utility: Wisconsin Energy Corp.  
Holding company for Wisconsin Electric Power

Project: Energy Oasys

Team Members	Role	Responsibilities
Wisconsin Energy	Co-Lead	Project direction, development, funding
Ameritech Corp	Co-Lead	Project direction, development, funding
Various manufacturers (Pensar, Johnson Controls)	Supplier	Plug-in display, thermostat, or other in-home device

Description: Energy Oasys utilizes two telecommunications modes--wireless paging to the customer and telephone lines from the customer--in addition to powerline carrier in the home. They want to offer a large suite of energy and non-energy services in the most flexible manner possible. Flexibility is built into the choice of in-home device, meter, and telecommunications mode. Their testing began with Pensar's Basic Customer Interface, a plug-in device; Johnson Controls' smart thermostat is to be tested in the pilot. An Information Gateway is retrofit to any standard meter. Energy Oasys focuses on responding to (1) the operating efficiency needs of utilities today with traditional DSM, AMR, tamper detection, etc. and (2) customer needs with load control, indoor air quality, security, and enhanced two-way communications.

Market: Wisconsin Electric Power started with employee homes in Milwaukee. They hope to target hard-to-read meters, areas with power surges or other service difficulties, and ultimately customers willing to pay for services in the pilot and roll-out. Neighborhoods not selected yet.

Status: As of January 1996, proof-of-concept testing was completed in 15 homes. A pilot with installation complete by end-March 1996 will expand participation to 200 homes. Roll-out to 5,000 customers is planned after April 1996.

#### Energy Services Offered

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information	Other
X	X	X	X	X	X	

AMR for electric, gas, and water is offered today. Wisconsin Gas has signed on with Wisconsin Electric Power; the water utility is negotiating. Up to 48 price signals every half-hour can be offered for TOU pricing. The wireless receiver can handle up to 124

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inputs, meaning unlimited control of major loads.

**Non-Energy Services Offered**

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
P	P					P

All non-energy services are planned offerings. Other services identified are indoor air quality monitoring (noxious gas control) and latch-key child monitoring.

Utility: Wright-Hennepin Cooperative Electric Association

Project: MeterMinder  
For description of vendor product, see page A-13.

Team Members	Role	Responsibilities
Wright-Hennepin	Lead	Project direction, funding, software development
Interactive Technologies Inc. (ITI)	Supplier	Meter Minder, ITI CS-4000 Central Station Receiver, software development

Description: The objectives of this project were (1) to make automated meter reading affordable, (2) to create a system to handle high bill complaints (Meter Minder identifies the day and time of high electricity usage), (3) to automate power outage reporting, and (4) to offer a home security system. Wright-Hennepin has achieved economies of scale using the same modem for both security and Meter Minder functions. The CPU or main panel is a 16" x 12" x 2" box, usually installed in the house, connected to a phone line and the meter. The CPU dials out to four different numbers at Wright-Hennepin to report security, monthly meter readings, usage history, and power outages. Wright-Hennepin prices the Meter Minder with a basic security package at no initial cost to consumers, who may add on door/window sensors and other components for a fee of \$300-500 on average. The customer, however, agrees to pay a \$17.50 monthly monitor fee for the home security add-on. These revenues essentially pay for automatic meter reading and other utility services (e.g., power outage reporting).

Market: The pilot targeted rural residential accounts. (Most of the coop's 29,000 members are residential). Approximately 3,000 Meter Minders have been installed in Wright-Hennepin's area. Wright-Hennepin also provides home security monitoring for several other utilities. At present, Wright-Hennepin provides monitoring services for about 2,000 accounts for Cimarron Electric Cooperative, South Central Indiana Electric Cooperative, NIPSCO, and Bangor Hydro.

Status: The 1991 pilot tested 100 Meter Minders for six months. Wright-Hennepin then started offering Meter Minders to all members (customers), adding on features as the technology evolved.

**APPENDIX B****Energy Services Offered**

Automated Meter Reading	Outage Detection	Remote On/Off	Load Control	TOU Pricing	Energy Information	Other
X	X				X	X

Billing is automated and 60 days of usage data are maintained at the meter which the utility can access, examine, and graph out for customers upon request. Customers can add on the energy saver module, which permits remote access to an ITI setback thermostat via touch tone phone so customers can turn on lights and turn up the heat in homes or cabins (from car or home).

**Non-Energy Services Offered**

Home Security	Medical Alert	Cable Television	Video on Demand	Telephone Service	Internet Access	Other
X				X		X

In addition to the services offered in the Meter Minder project, Wright-Hennepin Cooperative also offers cellphones, discounted AT&T wireless phone service (\$14.95/month for members; \$6.95/month for affiliated organization or large electricity consumers), discounted telephone long-distance service, a Service Gold appliance warranty program (for any manufacturer), and electric dispatching and security monitoring services to other utilities.

Issues:      • Wright-Hennepin is a cooperative and is not subject to regulatory oversight by a state PUC.

## **Interview Protocol: Focus Group and Individual Surveys**

This Appendix includes the interview protocol that was used by LBNL subcontractors to conduct personal interviews with customers.

### **C.1 Interview Protocol**

We are affiliated with the Center for Energy and Environmental Policy at the University of Delaware. We are conducting a Department of Energy sponsored research project aimed at exploring the possibilities of utilities offering customer services through the National Information Infrastructure, or the 'Information Superhighway' as it is most commonly referred to. The goal of this study is to see how electric and gas utilities could enable the customer to instantaneously access energy information, and allow the utility to remotely read your meter.

One of several options would be to use the equivalent of cable TV, and install a 'Smart Box' hooked up to your television, and monitoring devices hooked up to each of the major appliances, to allow you to monitor, and possibly control, your energy use. It would also be connected to your utility meter, allowing the utility to read your consumption without sending a meter reader to your house or possibly to read consumption of individual appliances.

To give you a better idea of the type of services that may be offered, we have described each of them and designed graphic displays as they may appear on your television screen. We have one sheet for each possible service.

Would you be willing to read the short descriptions and give us your reactions?

[If yes: Do you mind if I tape your comments, so I don't have to write everything down?]

### **C.2 Questions**

1.    A.    If the utility were to offer these type of services in your area, do you think that you would take advantage of this offer?
  - B.    Which ones would you consider useful to you? (Read from list)
  - C.    Why? (Ask for each)
  - D.    How would you use this information? (Ask for each)

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[After through with all the services listed]

2.     A.     Do you see any problems in the utility providing services to you via the Information Superhighway using the ‘Smart Box’ and the television as a display?  
       B.     If yes, what type of problems?
3.     Do you have any suggestions as to other services that could be offered, or other ways in which the utility could improve its information to customers?

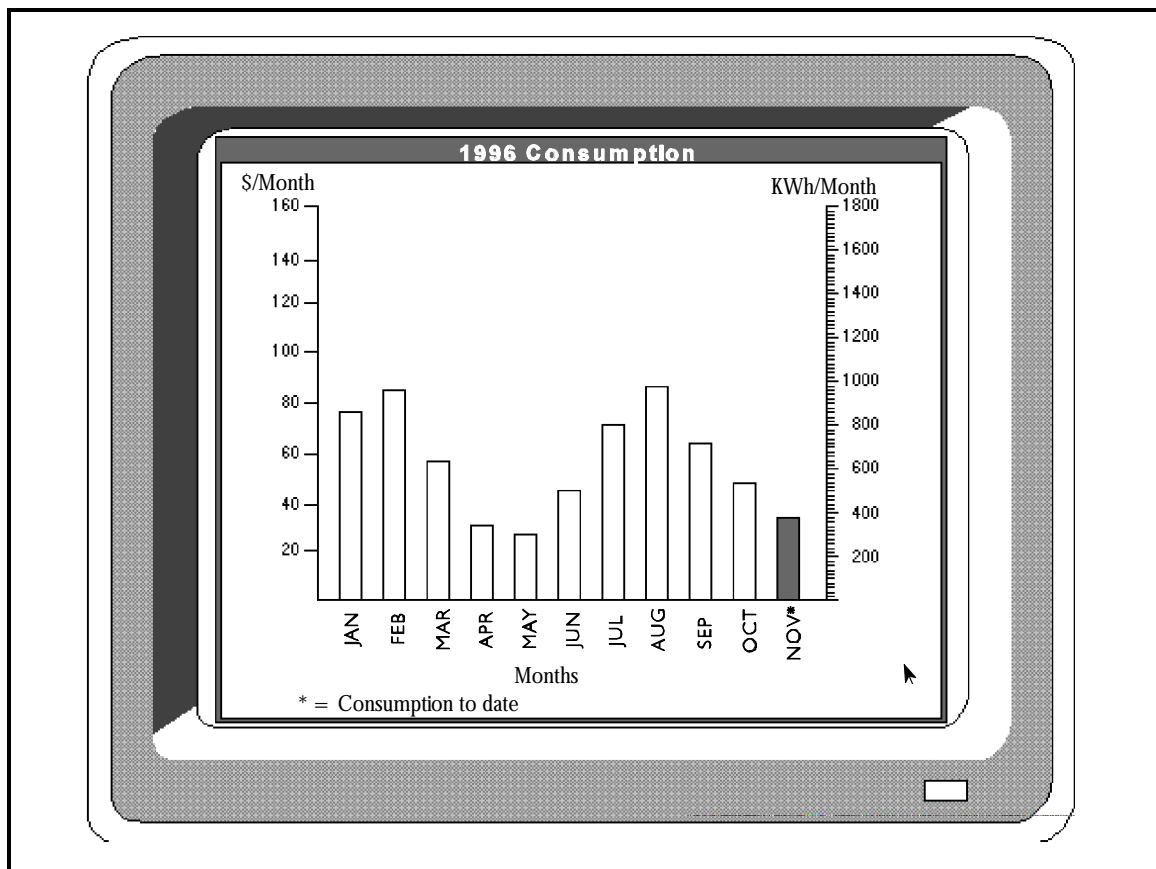
[For all the services listed]

4.     What would you be willing to pay to receive this service?  
       (See form; “Individual Valuation of Potential Services”)



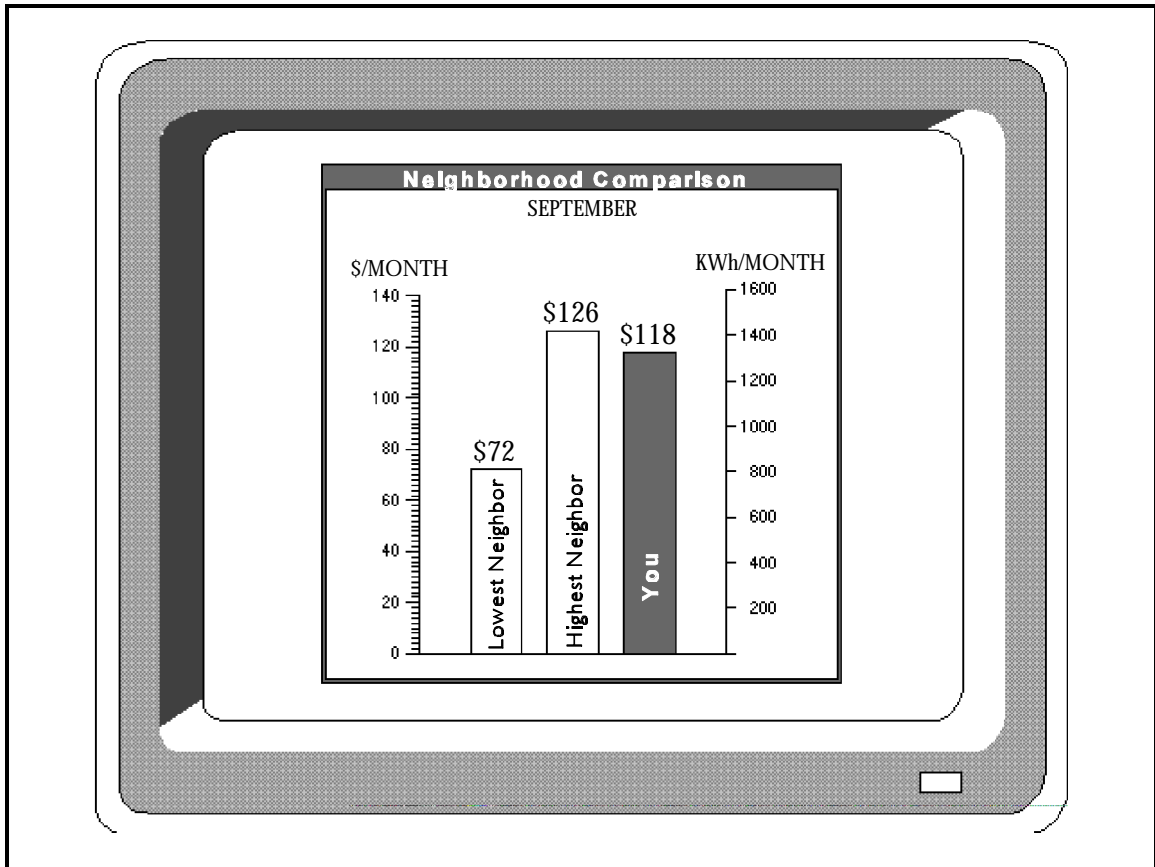
## 1. Historic Monthly Energy Consumption

This option enables the customer to compare energy usage per month over an entire year, or a longer period. If a customer wants to do this now, he or she needs to look through our old bills. Through the proposed system, this information would be obtained right on your television screen whenever you needed it. Energy bills for past months would be made available in graphical format. The same information could be made available for several years to compare annual consumption.



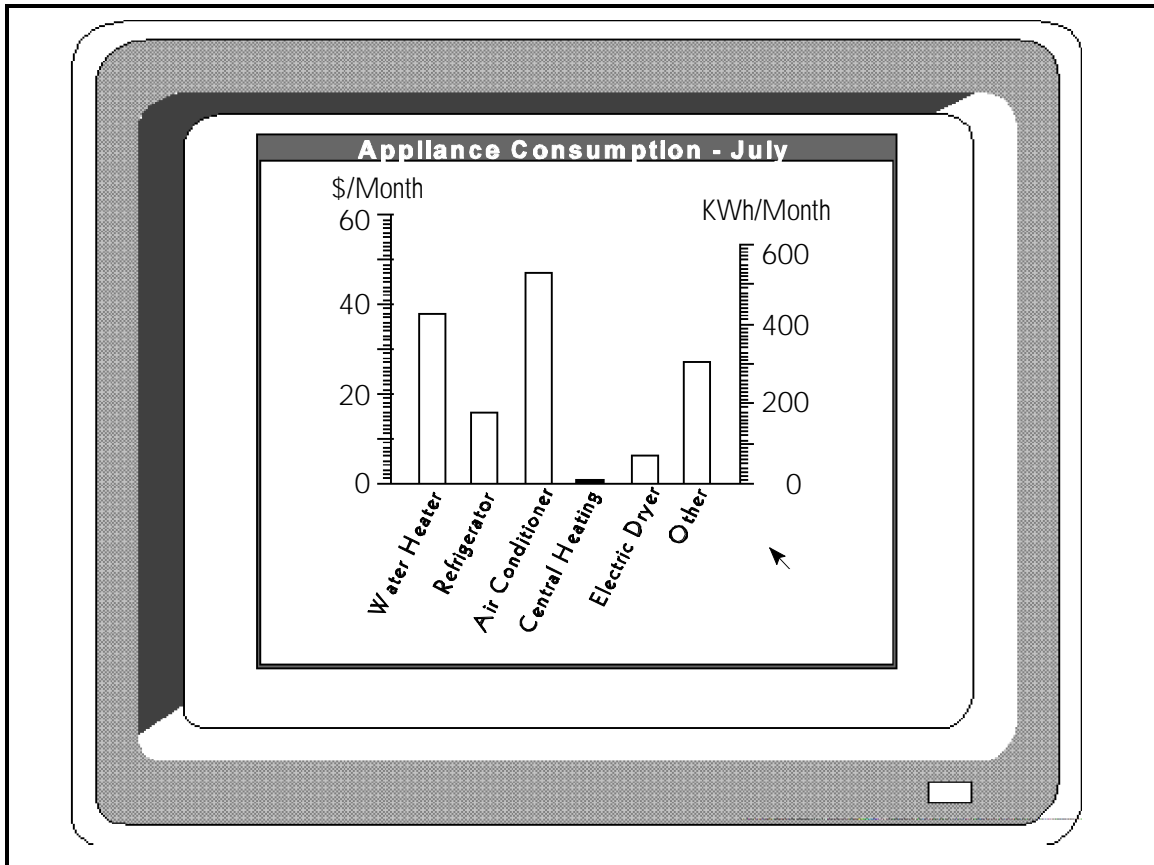
## 2. Neighborhood Comparison of Energy Use

People often ask their neighbors or friends about electric and gas bills, as a way of gauging whether their own use is high or low. Below is an example of a graph of household energy consumption for an entire neighborhood. Your household energy consumption is illustrated by the shaded bar graph. This allows you to compare your electric or gas bills with households in your neighborhood. Your neighbors cannot access data about your individual household energy consumption.



### 3. Appliance Energy Consumption Breakdown

This shows how much energy is consumed by each major appliance in the house. The consumer would be able to determine which appliances use the most electricity, hence making it easier to adjust energy use and reduce utility bills.



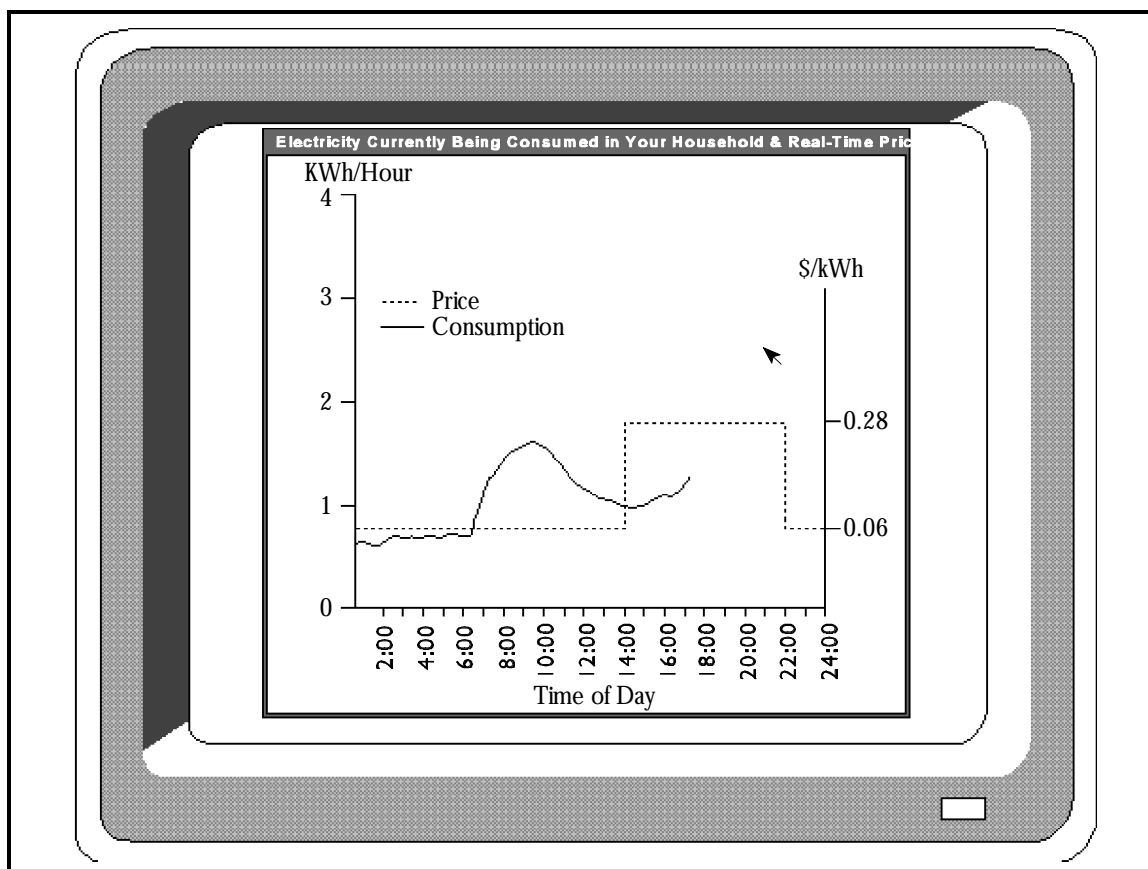
#### 4. Billing and Payment Plans

At a date each month set according to a utility billing schedule, your monthly bill would be calculated. It would be possible to review your bill and pay it directly via the television interactive system.

Billing		
<b>Billing Period</b>		
From	09/08	Days 30
To	10/08	
<b>Meter Reading</b>		
Previous		74948
Present		75366
Difference		418
<b>Total Consumption</b>		418 kWh
<b>Energy Charges</b>		
1st 30		6.18
Next	388 x 0.0888/kWh	34.45
<b>Fuel Adjustment</b>		
418 kWh	(0.0032)	1.34 cr
<b>Balance Due</b>		\$39.29

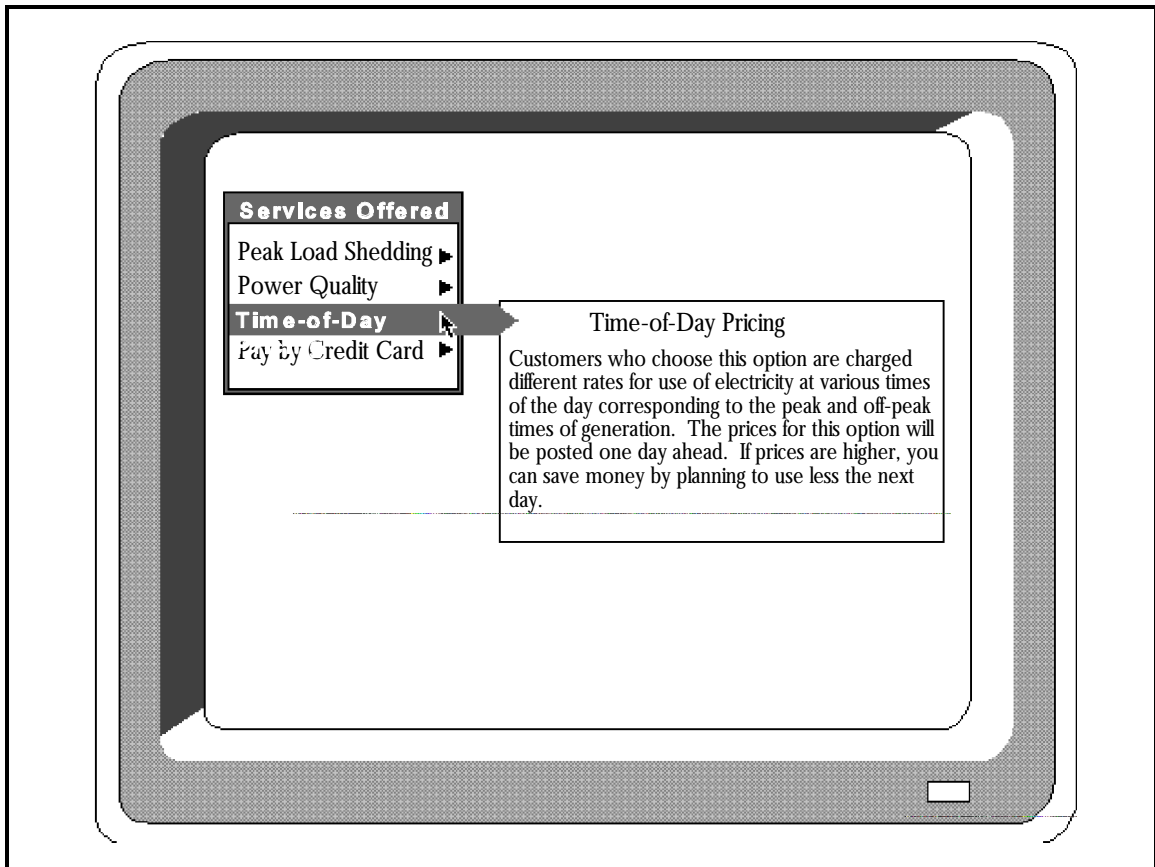
## 5. Instantaneous Consumption and Time-of-Day Pricing

Instantaneous Consumption and time-of-day pricing provide the amount of energy being used and the price at which the energy is sold. With access to this type of information, the customer can see how energy usage changes during the course of the day allowing the customer to decide how to save money on the energy bill by shifting energy demanding activities to periods of the day when the price is lower, or curtailing them at times of high prices. The time-of-day rates would normally be determined and posted a day in advance.



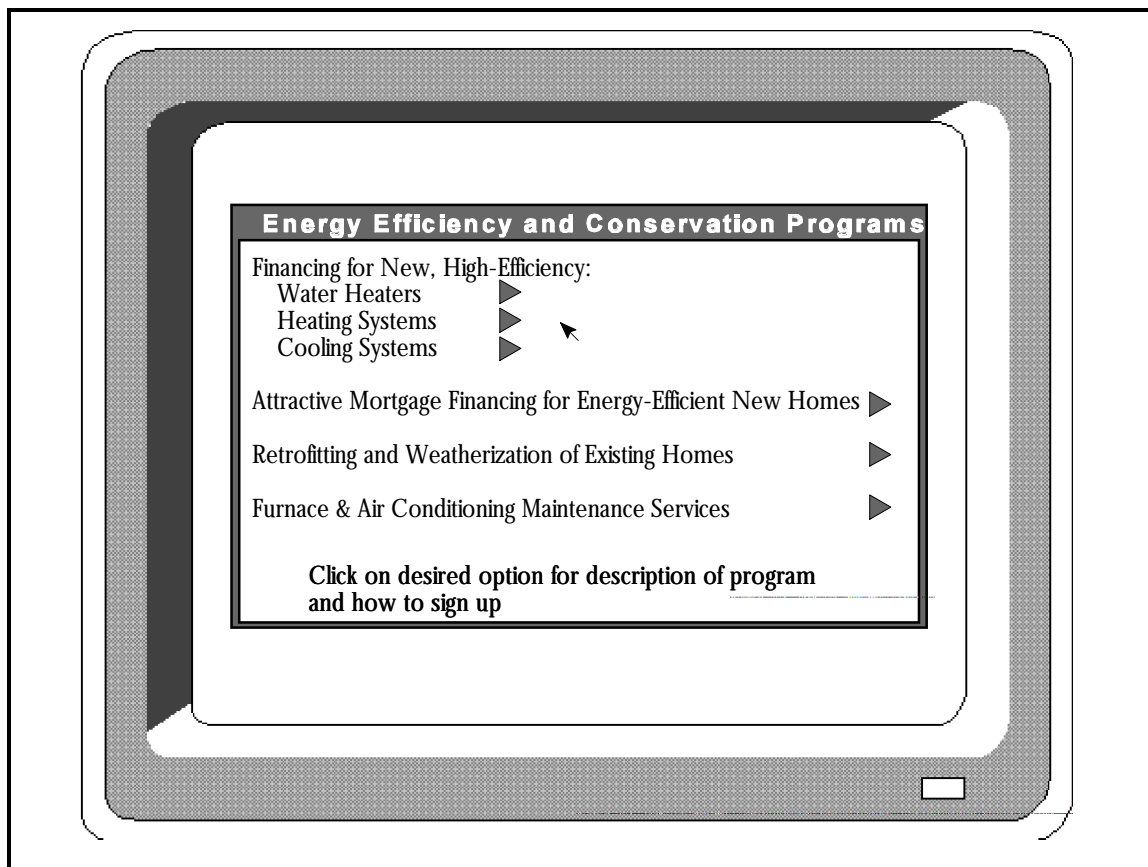
## 6. Energy Services Agreements and Rate Options

A number of energy service agreements and rate options could be offered by the utility. A description of each of the services, agreements and rate options would be available in a menu that would allow you to read about utility business offerings such as: peak load shedding, time-of-day pricing, power quality agreements, etc.



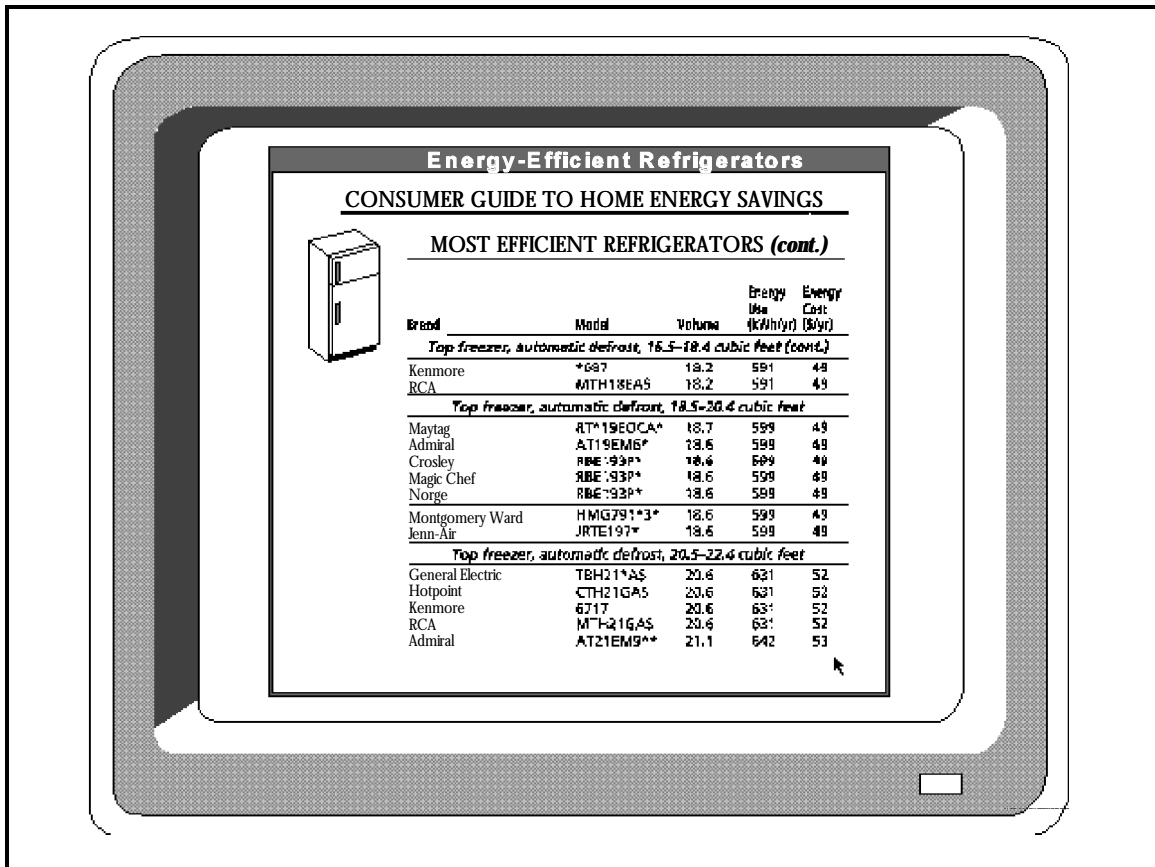
## 7. Energy Efficiency and Conservation Programs

The utility can provide information about the energy savings programs that they currently offer via this system. Customers could select any one of the program options from the menu to get a short description of the program and information on how to sign up.



## 8. Energy-Efficiency Product Information

Information about the most energy-efficient appliances on the market could be made available by the utility in table format.



**Energy-Efficient Refrigerators**

**CONSUMER GUIDE TO HOME ENERGY SAVINGS**

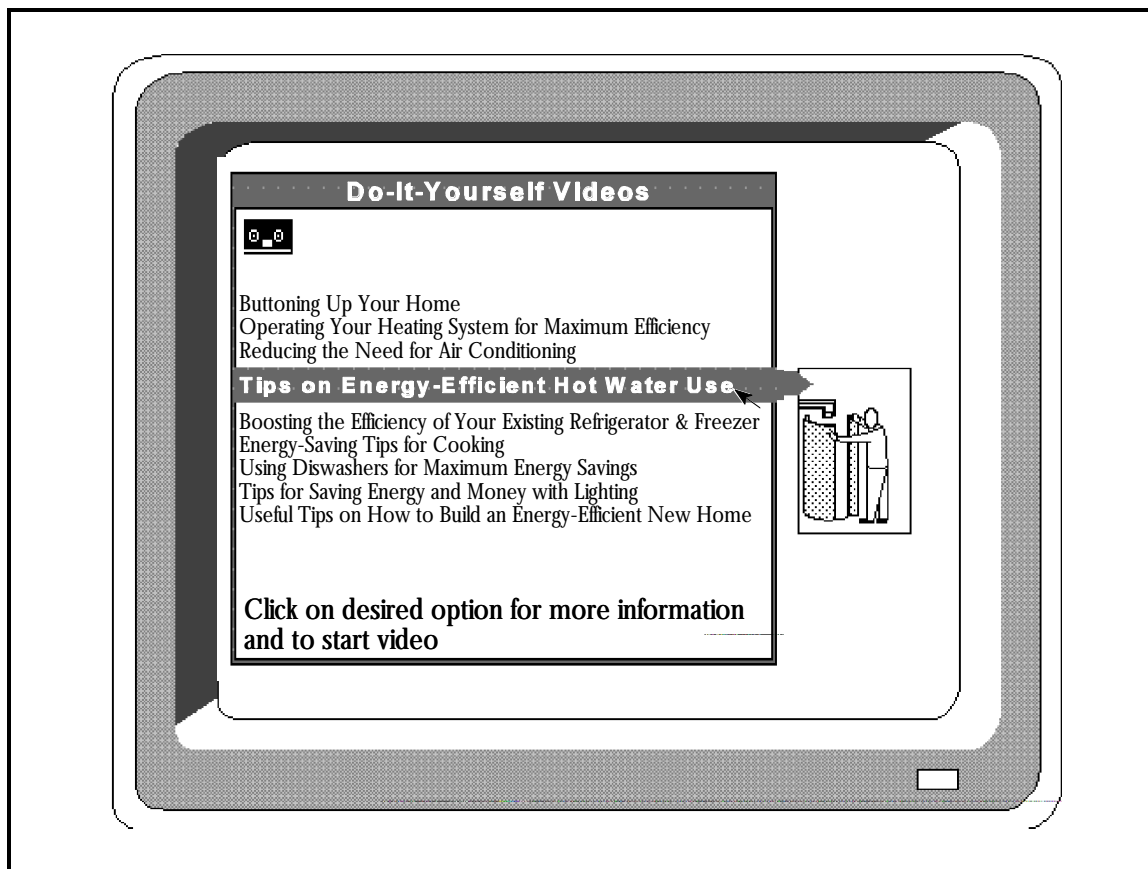
**MOST EFFICIENT REFRIGERATORS (cont.)**

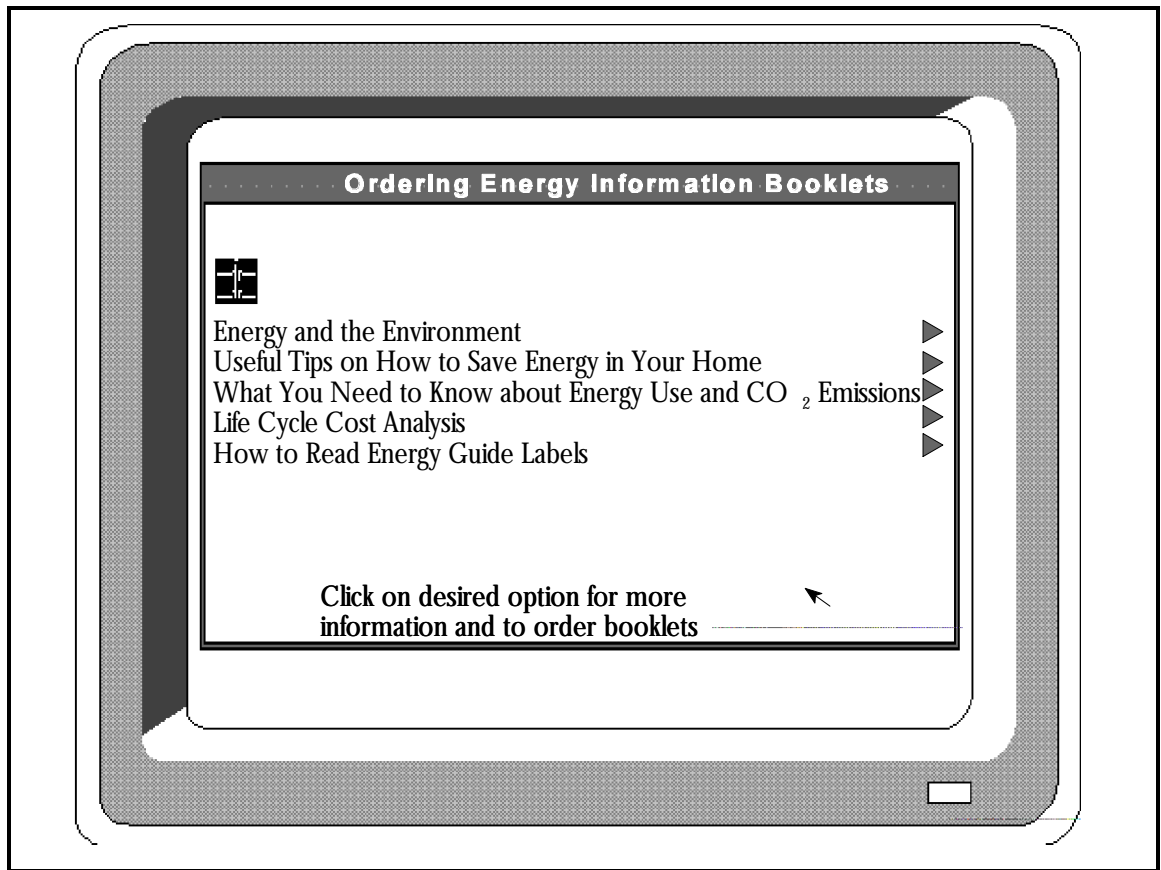
Brand	Model	Volume	Energy Use (kWh/yr)	Energy Cost (\$/yr)
<b>Top freezer, automatic defrost, 16.5-18.4 cubic feet (cont.)</b>				
Kenmore	*687	18.2	591	48
RCA	MT118EAS	18.2	591	49
<b>Top freezer, automatic defrost, 18.5-20.4 cubic feet</b>				
Maytag	AT*19EOCA*	18.7	599	49
Admiral	AT19EM6*	18.6	599	49
Crosley	RBE*93P*	18.6	599	49
Magic Chef	RBE*93P*	18.6	599	49
Norge	RBE*93P*	18.6	599	49
Montgomery Ward	HMG791*3*	18.6	599	49
Jenn-Air	JRTE197*	18.6	599	49
<b>Top freezer, automatic defrost, 20.5-22.4 cubic feet</b>				
General Electric	TBH21*AS	20.6	631	52
Hotpoint	CTH21GAS	20.6	631	52
Kenmore	6717	20.6	631	52
RCA	MT*21GAS	20.6	631	52
Admiral	AT21EM9**	21.1	642	53



## 9. “Do-It-Yourself” Videos and Ordering Energy Information Booklets

“Do-it-yourself” videos and energy information booklets could be offered via this system. All videos and booklets available from the utility could be listed in menus as shown below and customers could select any one to get a short description of the video or booklet and instructions on how to start a video or order a booklet. Making use of the “do-it-yourself” videos and the energy information booklets would put the customer in a better position to save money, improve the comfort in their homes and help the environment.





## 10. Scheduling of Installation, Field Services, and Repairs

The utility could offer an interactive scheduling service that would allow customers to plan ahead and suggest suitable times when service personnel from the utility could come to their residence to perform energy services and install or repair equipment. By the use of a timetable, the customer could inform the utility directly when would be the best time to find someone available at the residence. A sub-menu with all the programs and common repair services available through this direct scheduling service would appear. Below we have given an example of a 'Schedule for Electric Meter Repairs'

**Schedule for Meter Repair Crew**

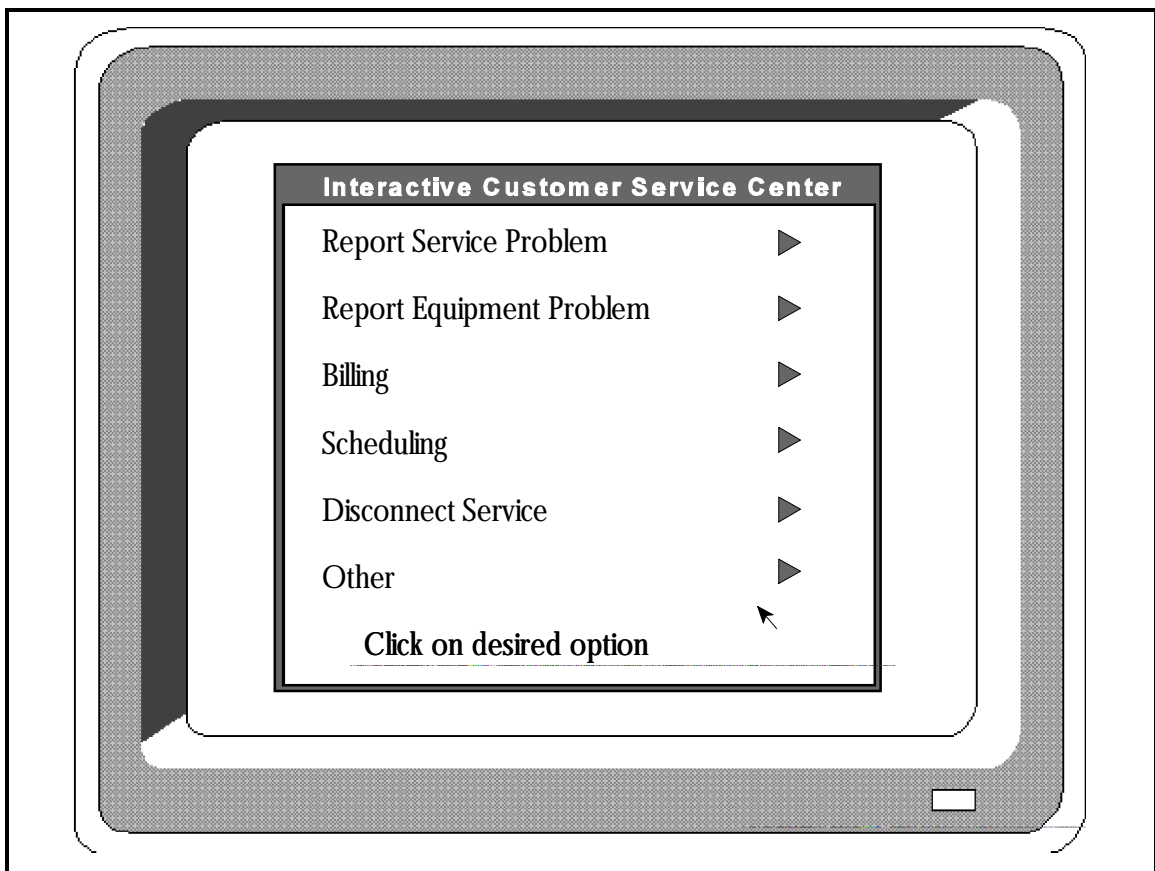
Time	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
8:00	X		X				
9:00	X		X				
10:00	X			X			
11:00	X			X	X		
12:00					X		
1:00					X		
2:00							
3:00			X				
4:00			X				
5:00			X				
6:00			X				

X All of our crews are already busy during these periods  
 A higher per-hour charge applies to non-business hours

Click on the time you would like to schedule your service visit and enter the requested information

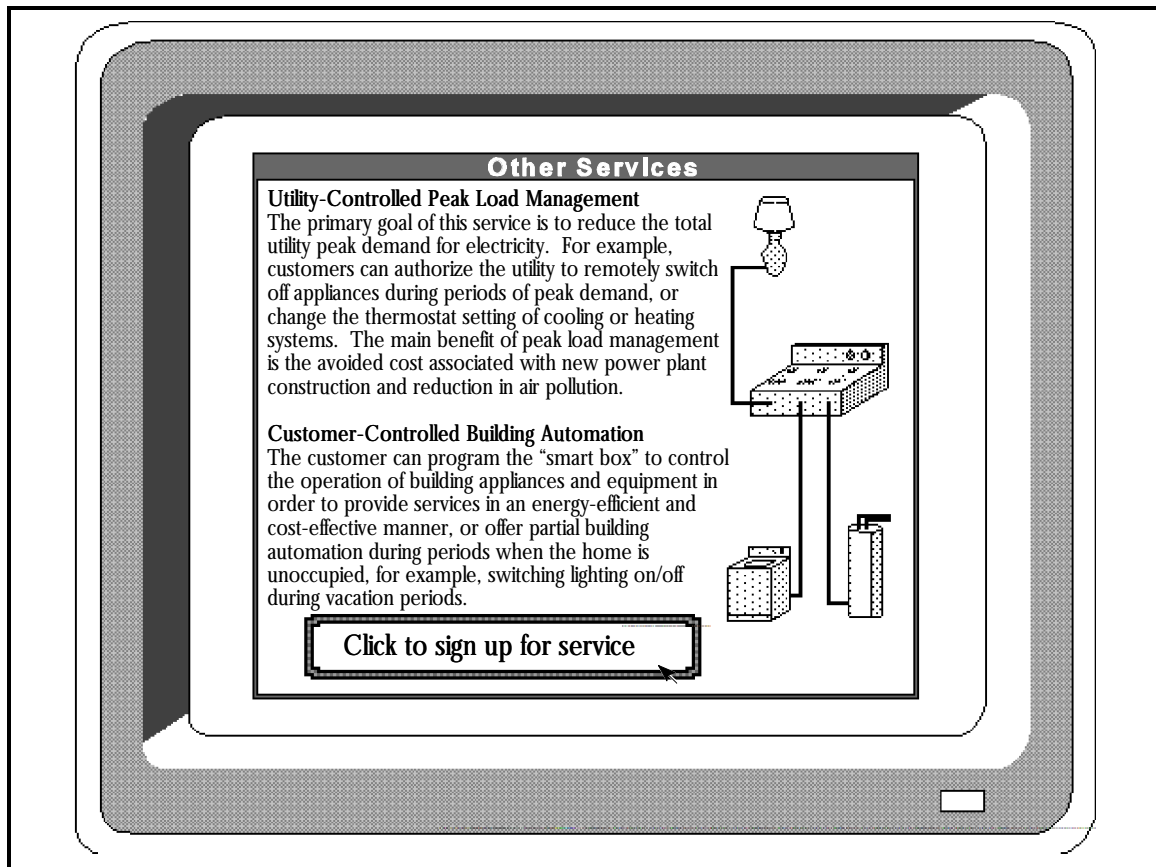
## 11. Specific Customer Queries

This service can be described as an interactive customer service center and could work almost like an electronic mail-box. Customers can report service problems, make requests, acquire information about their account, or obtain answers to common customer queries made to the utility via their utility service display module. Customers could pose questions or place requests by typing them in at any convenient time of the day or night and later receive answers from the utility. The following menu lists some basic options, but does not represent the limit of the information that could be offered via this type of service.



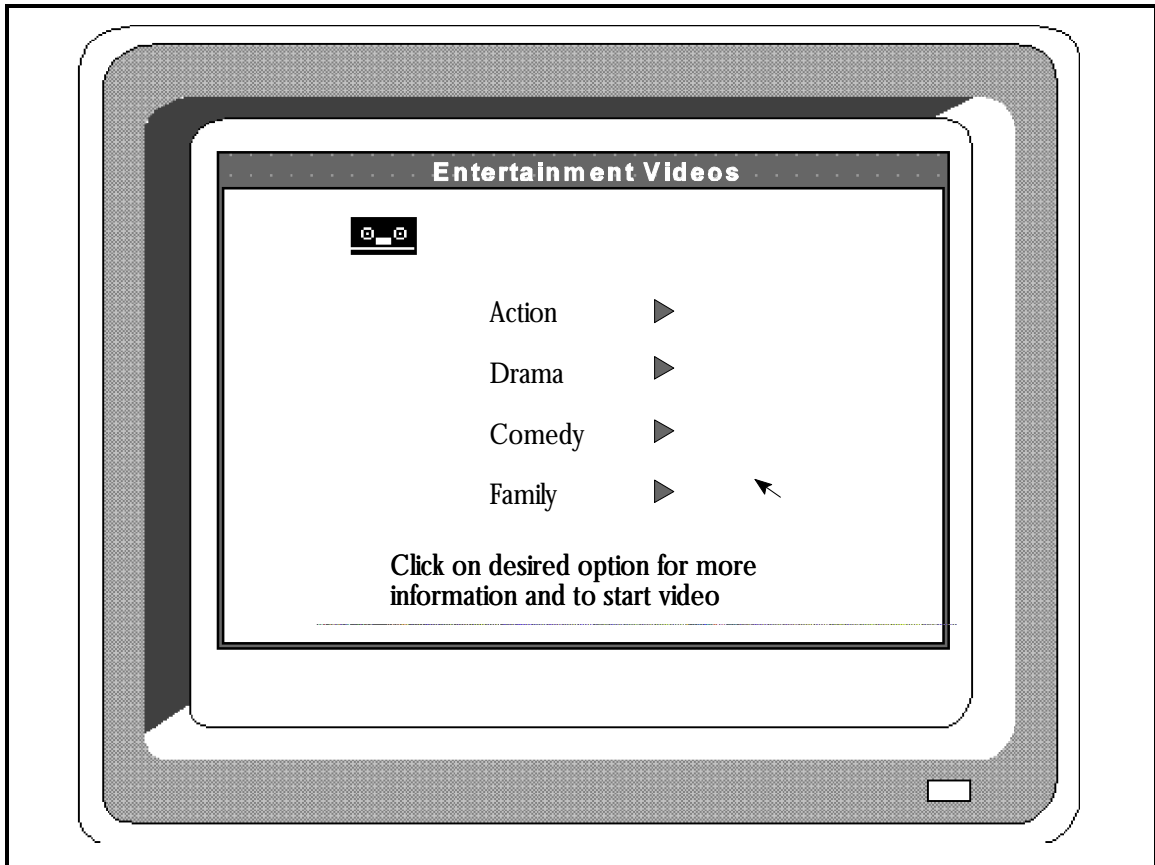
## 12. Load Management and Building Automation

The utility could provide services to reduce the use of energy during peak hours of demand, and customers could make use of the same system to control time and operation of appliances based on their own time-schedule. This could be used to avoid costly peak hours or to match appliance use, for example heating, to your individual time schedule.



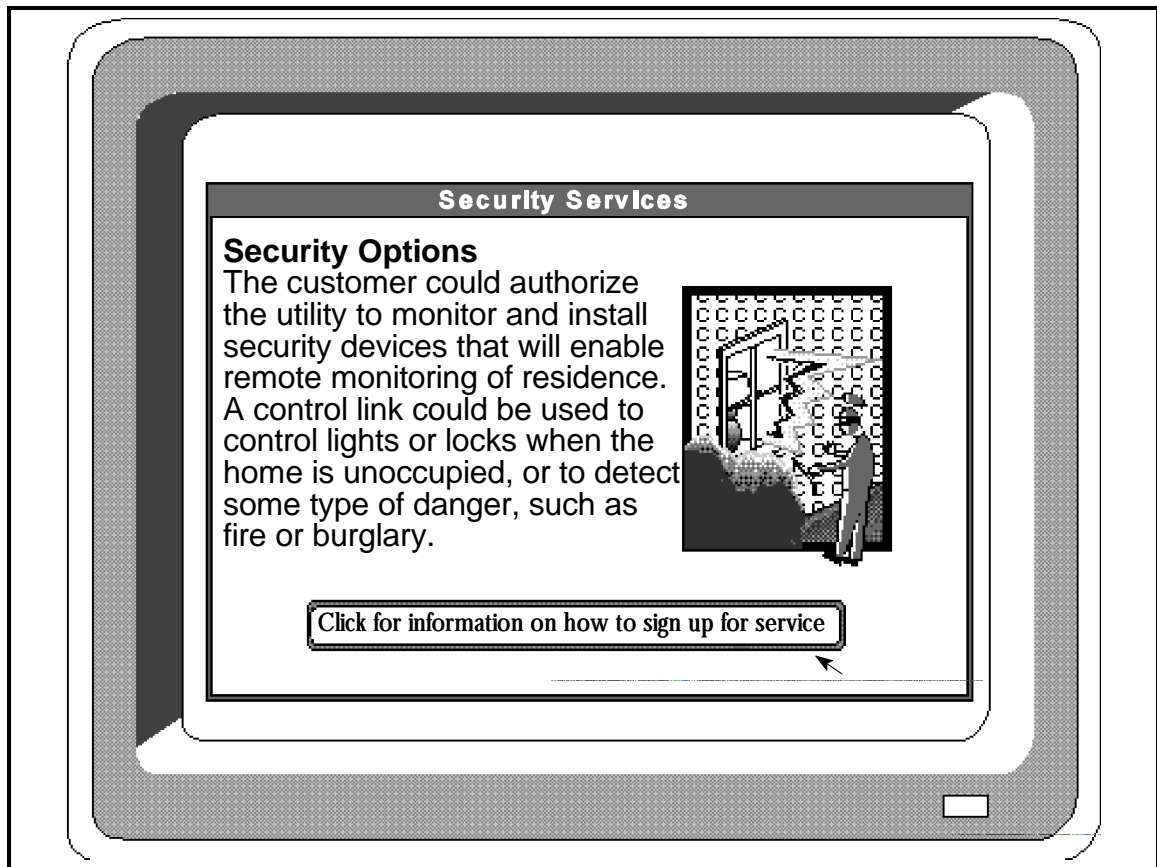
13. Entertainment Video on Demand

You can pick from a set of recent movie releases to see in your home. This service would operate much as a pay-per-view service and you could view the movie of your choice at any time you want.



#### 14. Security Services

The utility could provide security services that will allow the remote monitoring and control of residences. Devices could be used to control lights or locks when home is unoccupied to deter and detect events such as burglary.







## Customer Survey on Willingness to Pay

This Appendix includes our survey questionnaire on customer willingness to pay for various services which participants filled out at the end of the focus group or personal interview.

### Instructions:

- a. Enter the amount you would pay per month to receive service in cents or dollars;
- b. Put 0 if you like the service, but wouldn't want to pay for it;
- c. Put X if you wouldn't want the service, even if it was free;
- d. For service options 8, 9 and 10, please enter amount per use of service also.

Service Option	\$ per month	\$ per use
1. Historic Monthly Energy Consumption	_____	
2. Neighborhood Comparison of Energy Use		_____
3. Appliance Energy Consumption Breakdown		_____
4. Billing and Payment Plans	_____	
5. Instantaneous Consumption and Time-of-Day Pricing		_____
6. Energy Services Agreements and Rate Options	_____	
7. Energy Efficiency and Conservation Programs	_____	
8. Energy Efficiency Product Information	_____	_____
		—
9. “Do-it-yourself” Videos and Ordering Energy Information Booklets	_____	_____
		—
10. Scheduling of Energy Savings Program Installation, Field Services and Repairs	_____	
11. Specific Customer Queries	_____	
12. Load Management and Automation	_____	
13. Entertainment Videos on Demand	_____	_____
		—

14. Security Services

\_\_\_\_\_

Table D-1 summarizes survey questionnaire results on focus group (FG) participants and interviewees (INT) interest in and willingness-to-pay for individual services.

**Table D-1. Customer Reactions to Energy and Non-Energy Services**

No.	Service	Like the Service But Would Not Want to Pay for It	Would Not Want the Service Even If Free	Willingness-to- Pay per Month (\$)	Pay-per-Use (\$)
1	Monthly Consumption				
	FG	5	2		
	INT	2		\$0.50, 0.50, 1, *, 5	
2	Neighborhood Comparison				
	FG		6	0.50, 0.50, 1, *, 0.50,	\$1
	INT	3			2
3	Appliance Breakdown				
	FG	4	3		
	INT	3	1	\$0.50, 1, *, 0.50, 0.50	
4	Billing and payment plans				
	FG	1	6		0
	INT	6		\$0.50, *, 0.50	
5	Time-of-Use Pricing				
	FG	5			\$1
	INT	5	1	0.50, 0.50, *	
6	Energy Services & Rate Options				
	FG	5			
	INT	6	2	*, \$2, **	
7	Energy-Efficiency Program Info				
	FG	4			
	INT	5	3	*, \$1, 3, 0.50	
8	Energy-Efficient Product Info				
	FG	2	4		\$1.50, 1, X, X
	INT	3		*, 2	1.50, 1, 1, 1

**APPENDIX D**

No.	Service	Like the Service But Would Not Want to Pay for It	Would Not Want the Service Even If Free	Willingness-to- Pay per Month (\$)	Pay-per-Use (\$)
9	Do-it-yourself Videos & Booklets				
	FG	4	2		\$1, 3, 0, 0
	INT	6	1		2.50
10	Scheduling Repairs & Services				
	FG	2	5		
	INT	8		\$2	
11	Customer Queries				
	FG	4	3		
	INT	7	1	\$2	\$2
12	Load Mgmt. & Automation				
	FG	5			
	INT	7			
13	Entertainment Video on Demand				
	FG		3	\$10, 10	\$3, 2.50, 3, 2, X
	INT	3		1, 2, 10, 2, 25	2.50, 2, 5, 5
14	Security Services				
	FG			\$10	
	INT	4		10, 30, 2, 1, 12	

\* One interviewee would prefer an annual maintenance fee of not more than \$60 for Services 1 through 8.

\*\* One of the respondents was willing to pay a “one-time” set-up fee of \$15, subsequent willingness to pay would depend on cost/savings ratio

**Notes:** The number of responses may not add up to 10 for individual interviews since not all respondents answered the question for each service. One interviewee was willing to pay \$2 per month to have all the services available plus a \$5 for Pay-per-Use fee for each service.